SUPREME COURT OF THE UNITED STATES.

No. 183.

THE CITY OF CHICAGO, APPELLANT,

vs.

SAMUEL NICHOLSON.

APPEAL FROM THE CIRCUIT COURT OF THE UNITED STATES FOR THE NORTHERN DISTRICT OF ILLINOIS.

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1 Pleas in the Circuit Court of the United States of America, for the northern district of Illinois, in chancery sitting, at the city of Chicago, in the district aforesaid, before the Hon. Thomas Drummond, judge of the District Court of the United States for the northern district of Illinois, and in the absence pro tempore of the Hon. David Davis, one of the justices of the Supreme Court of the United States of America, sole judge of said Circuit Court, on Monday the seventh day of January, in the year of our Lord one thousand eight hundred and sixty-seven, and of our independence the ninety-first year.

WILLIAM H. BRADLEY, *Clerk.*

SAMUEL NICOLSON
vs.
THE CITY OF CHICAGO. } In chancery.

2 NORTHERN DISTRICT OF ILLINOIS, *ss:*

Be it remembered. that on this day, to wit, the ninth day of November, in the year of our Lord one thousand eight hundred and sixty-four, came Samuel Nicolson, complainant, by Goodwin, Larned & Goodwin, his solicitors, and filed in the office of the clerk of the Circuit Court of the United States, for the northern district of Illinois, at Chicago, in said district, his bill of complaint against the city of Chicago, defendant, and also at the same time filed in the said clerk's office his bond for costs in the said entitled cause, which said bill of complaint and bond are in the words and figures following, to wit:

3 Circuit Court of the United States, 8th circuit, northern district of Illinois.—In chancery.

Bill of complaint.

To the judges of the Circuit Court of the United States for the northern district of Illinois, sitting in chancery:

Samuel Nicolson, of Boston, in the State of Massachusetts, and a citizen of the State of Massachusetts, brings this his bill against the city of Chicago, in the State of Illinois, a municipal corporation created by and existing under the laws of the State of Illinois, and having its domicile in the said last-mentioned State, and in the northern district thereof.

4 And thereupon your orator complains and shows that heretofore, and on the eigth day of August, in the year of our Lord one thousand eight hundred and fifty-four, your orator being then and now a citizen of the United States of America, was the original and first inventor of a new and useful improved wooden pavement, in certain letters patent of the United States and in the schedule hereinafter mentioned, set forth, and fully described; that the said invention was not, at the time of your orator's application for a patent, as hereinafter first mentioned, in public use or on sale

with your orator's consent or allowance; that your orator, being the original and first inventor of the said improved wooden pavement before mentioned, and being a citizen of the United States, made application in due form of law to the Commissioner of Patents of the United States for the grant of letters patent for the said improved wooden pavement, and was duly sworn to the specifications for that purpose, and your orator having complied with all the conditions and requirements of the acts of Congress in that case provided, did on the same eigth day of August, in the year one thousand eight hundred and fifty-four, obtain, and there was issued and delivered to your orator, certain letters patent under the seal of the Pat-
5 ent Office of the United States, duly signed by the Secretary of the Interior of the United States, and countersigned and sealed by the Commissioner of Patents of the United States, bearing date the day and year last aforesaid, whereby there was secured to your orator, his heirs, administrators, or assigns, for the term of fourteen years from and after the date of the said letters patent, the full and exclusive right and liberty of making, constructing, and using, and of vending to others to be used, the said improved wooden pavements in the said letters patent mentioned and referred to; that a legal description of said improved wooden pavements was given in the words of your orator, the said patentee himself, in a certain schedule in writing, which was accompanied by drawings and written references, in due form of law annexed to said letters patent last mentioned, when the same were issued, and which schedule made a part of the said last-mentioned letters patent, as by a certified copy of said last-mentioned letters patent and schedule annexed in due form of law now here in court ready to be produced, reference being thereto had for greater certainty will more fully and at large appear.

And your orator further shows unto your honors, that afterwards and on the first day of December, in the year of our Lord one
6 thousand eight hundred and sixty-three, your orator did make at Washington a formal surrender of said original letters patent last mentioned, in conformity with the law in such cases provided, for the purpose of obtaining a new patent to be issued for the same invention upon a corrected description and specification, accompanied with drawing and figures of the said improved wooden pavements, describing the said invention and pointing out in what it consisted in more full, clear, and exact terms than was done in the original specifications, whereupon, at the city of Washington, on the first day of December, in the year one thousand eight hundred and sixty-three, the said first-mentioned letters patent were legally cancelled and a new patent for the same invention was made, issued, and granted from the Patent Office of the said United States in due form of law upon said corrected description and specification, and explanatory drawings, unto your orator, which said new and reissued letters patent granted to your orator for the said improvement in wooden pavements and invention aforesaid were marked No. 1,583, and were issued under the seal of the Patent Office of the United States, and

countersigned and sealed by the Commissioner of Patents of the said United States, bearing date the first day of December, in
7 the year one thousand eight hundred and sixty-three, whereby there was secured to your orator, his heirs, administrators, or assigns, for the term of fourteen years from the said eigth day of August, in the year one thousand eight hundred and fifty-four, the full and exclusive right and liberty of making, constructing, using, and vending to others to be used, the said improvement in said reissued letters patent described; that a legal corrected description and specification of said improvement was given in the words of your orator himself in a certain scedule, which was accompanied by drawings and written references in due form of law annexed to said new and reissued letters patent when the same were issued, and which said last-mentioned schedule made a part of said new and reissued letters patent, as by the said last-mentioned letters patent signed and sealed as aforesaid, now brought here into court and ready to be produced, as this honorable court shall direct, (a copy of which, without the drawings making part of the same, are hereto annexed, marked schedule A, forming part of this bill of complaint,) reference being thereto had, will more fully and at large appear.

And your orator further shows unto your honors, that since
8 the granting of said original letters patent, and since the granting to your orator of the said new and reissued letters patent last mentioned, your orator, and those claiming under him by assignment, license, or otherwise, have made, constructed, and used in different parts of the country the said improved wooden pavement of your orator in the said letters patent described, and the said improvement in wooden pavements has been extensively used in the department of art to which it belongs, to the great benefit of the public, whereby your orator might and would have derived to himself greater profit than he had been able to realize, but for the combined and illegal interference with the just exercise of your orator's rights as secured to him by the said reissued letters patent hereinafter mentioned; and that your orator is now still entitled to the exclusive possession and enjoyment of the said improvement and invention, and that the same is of great value.

And your orator further shows unto your honors, that the validity of your orator's said patent, and your orator's exclusive right to the privileges and monopoly of the said invention, have become fully settled and established by your orator's long and extensive use of the same, and the acquiescence of the public therein by the pur-
9 chase and use of the same in many different parts of the country, and by the acceptance of grants and licenses under your orator, so that your orator's title to the said improvement and invention secured to your orator by the said reissued letters patent last mentioned and your orator's exclusive rights therein remain without reasonable question.

And your orator further shows unto your honors, that your orator is informed and believes that since the said first day of December, in the year one thousand eight hundred and sixty-three, and at divers times and occasions between that time and the filing of this, your

orator's, bill of complaint, the defendant herein, The City of Chicago, at Chicago, in the northern district of Illinois, well knowing the facts aforesaid, and without any legal assignment, grant, or license therefor, and in violation and defiance of your orator's patent rights aforesaid, has made, constructed, and used the said improvement in wooden pavements in the said reissued letters patent mentioned, and has caused to be made, constructed, and used in the said city of Chicago, in various parts of said city, and in various ways wooden pavements, substantially like and upon the plan and principle, and in imitation of and embracing the invention and improvement of your orator contained in his said last-mentioned reissued letters patent No.
10 1,583, dated December 1, 1863; and that the said defendant is now constructing and using the same at will, and causing the same to be constructed and used, and persists in so doing, and refuses to desist, though warned and requested so to do, whereby great injury has resulted to your orator, and great gains and profits to a large sum of money have accrued to the said defendant from the appropriation and use of your orator's exclusive rights, and from the making, constructing, and using his improvement aforesaid, which your orator shows has been of great value to the said defendant, the full amount of which said gains and profits and value thus unlawfully derived is unknown to your orator; but which your orator shows, in equity, belong to your orator, and should be accounted for by said defendant, and paid over to your orator as the avails of his exclusive patent rights aforesaid, and profits and gains and value which your orator would have derived from his exclusive patent rights, but for the unlawful acts of the said defendant. And your orator well hoped that the said defendant would have desisted from the said illegal invasion of your orator's said exclusive patent rights, and would have accounted for and paid over to your orator the avails and value
11 of his said patent rights and the gains, profit, and value thus unlawfully derived.

But now, so it is, may it please your honors, that the said defendant, combining and confederating together to and with divers other persons, as yet to your orator unknown, (but whose names, when discovered, your orator prays may be herein inserted as defendants, with proper and apt words, to charge them,) how to injure and oppress your orator, wholly refuses to desist from their said unlawful invasion of your orator's exclusive patent rights aforesaid, or to account for and pay over to your orator the said unlawful derived gains, profits, and value aforesaid; and for excuse therefor the said confederates sometimes give out and pretend that the said invention of your orator was not new and useful, and that your orator was not the original and first inventor of the improved wooden pavement or the said improvement in wooden pavements so patented to him as aforesaid; and sometimes the said confederates give out and pretend that the said defendant has lawful right by assignment, grant, or license from your orator to use the same.

Whereas your orator expressly charges the contrary of all such pretences to be true. All which actings and doings of the said defendant and confederates are contrary to equity and good con-

12 science, and tend to the manifest wrong, injury, and oppression of your orator.

In tender consideration whereof, and forasmuch as your orator is remidiless in the premises at and by the strict rules of the common law, and can have adequate relief only in a court of equity, where matters of this nature are properly cognizable and relievable.

To the end therefore that the said defendant may show, if the said defendant can, why your orator should not have the relief hereby prayed, and may, (but not upon oath, the necessity of an answer upon oath being hereby expressly waived,) according to the best and utmost of the said defendant's knowledge, information, remembrance, and belief, full, true, direct, and perfect answer make to all and singular the matter and charges aforesaid, and that as fully as if the same were herein again repeated and the said defendant thereto interrogated paragraph by paragraph numerically, and that the said defendant may be compelled by the decree of this honorable court to account for and pay over to your orator such gains and profits as have accrued or arisen to the said defendant from the use, appropriation,

13 and invasion of your orator's invention and patent rights aforesaid, and the value thereof, to the said defendant, being the profits and avails which your orator would have derived from the construction and use of his said improvement and invention, but for the unlawful acts of the said defendant, and the value thereof to the said defendant; and that the said defendant and the attorneys, agents, servants, contractors, and workmen of the said defendant may be perpetually enjoined and restrained by the decree and injunction of this honorable court from making, constructing, or using, or causing to be made, constructed, or used the said improvement in wooden pavements of your orator in his said reissued letters patent mentioned and described, and from making, constructing, or using any wooden pavement substantially like and upon the plan and principle of your orator's said improvement, or for such other and further relief, or either and both, as your orator's case may require and may be agreeable to equity and good conscience.

May it please your honors, the premises considered, to grant unto your orator the people's most gracious writ of injunction, issuing out of and under the seal of this court, enjoining and restraining the said defendant as in the prayer of this, your orator's, bill set forth, until the further order of this honorable court.

May it please your honors also to grant unto your orator

14 the people's most gracious writ of subpœna, issuing out of and under the seal of this court, directed to the said defendant above named, thereby commanding the said defendant by a certain day and under a certain penalty to be and appear in this honorable court to answer this, your orator's, bill of complaint, and to stand to and abide by and perform such decree as the court shall make in the premises and shall be agreeable to equity and good conscience.

And your orator will ever pray, &c.

SAMUEL NICOLSON.

GOODWIN, LARNED & GOODWIN,

Sol's and of Counsel for Comp't.

UNITED STATES OF AMERICA, *District of Massachusetts, ss*:

Samuel Nicolson, of the city of Boston, being duly sworn, says: That he has heard the foregoing bill of complaint, signed by him, read; that he knows the contents thereof, and that the same is true, of his own knowledge, except such matters as are therein stated on his information and belief, and as to those matters he believes it to be true.

Subscribed and sworn to this 1st day of November, A. D. 1864, before me.

[SEAL.]

N. J. CLIFFORD,
Clerk U. S. Cir. C't Mass. Dist.

{ 5-cent revenue stamp, }
{ N. J. C., Nov. 1st, 1864. }

15 *Schedule A.—No.* 1,588.

The United States of America to all whom these letters patent shall come:

Whereas, Samuel Nicolson, of Boston, Mass., has alleged that he has invented a new and useful improvement in wooden pavements, (for which letters patent were issued to him, dated August 8, 1854, which letters having been surrendered by him, the same have been cancelled, and new letters ordered to issue to him, on an amended specification,) which he states has not been known or used before his application; has made oath that he is a citizen of the United States; that he does verily believe that he is the original and first inventor or discoverer of the said improvement, and that the same hath not, to the best of his knowledge and belief, been previously known or used; has paid into the treasury of the United States the sum of thirty dollars, and presented a petition to the Commissioner of Patents, signifying a desire of obtaining an exclusive property in the said improvement, and praying that a patent may be granted for that purpose.

These are, therefore, to grant, according to law, to the said Samuel Nicolson, his heirs, administrators or assigns, for the term of
16 fourteen years from the eigth day of August, one thousand eight hundred and fifty-four, the full and exclusive right and liberty of making, constructing, using, and vending to others to be used, the said improvement, a description whereof is given in the words of the said Samuel Nicolson, in the schedule hereunto annexed, and is made part of these presents.

In testimony whereof, I have caused these letters to be made patent, and the seal of the Patent has been hereunto affixed. Given under my hand, at the city of Washington, this first day of December, in the year of our Lord one thousand eight hundred and sixty-three, and of the independence of the United States of America, the eighty-eighth.

[SEAL.] J. P. USHER, *Secretary of the Interior.*

Countersigned and sealed with the seal of the Patent Office.

D. P. HOLLOWAY,
Commissioner of Patents.

17 *The schedule referred to in these letters patent, and making part of the same.*

To all whom it may concern:

Be it known that the following is a full, clear, and exact description of the new and useful improved wooden pavement invented by me, Samuel Nicolson, of Boston, in the State of Massachusetts, and for which letters patent were granted to me on the eighth day of August, in the year of our Lord one thousand eight hundred and fifty-four, the said letters patent having been surrendered for the purpose of describing the same invention, and pointing out in what it consists in more clear, full, and exact terms than was done in the original specifications.

The nature and object of my invention is the creation and constructing of such a wooden pavement for streets and roadways as shall be comparatively permanent and durable, by so uniting and combining all its parts, both superstructure and foundation, so as to provide against the slipping of the horses feet, against noise, against unequal wear, and against rot on and from the top surface, and against rot and consequent sinking away from below, or the
18 working of the gravel or other material under the blocks, so as to cause inequalities in the surface.

For a clear understanding of the manner of constructing my improved wooden pavement, I refer to the accompanying drawings with corresponding letters of reference, making part of these specifications, of which drawing No. I, figure 1, represents a top view of the first plan of said pavement, and figure 2 of the same drawing represents a transverse and vertical section of the same, and figure 1 of drawing No. II represents a perspective view of the said pavement, constructed after the second plan of modification, and figure 2, drawing No. II, a further perspective view of the said pavement on the first plan, and figure 3, drawing II, a further perspective view of the said pavement on the second plan.

The earth of a roadway upon which my improved wooden pavement is to be constructed, must first be suitably graded in any of the usual and well known methods, in order to prepare it for the reception of such pavement.

When the street or roadway has been thus prepared for the reception of my pavement, I then cover the surface of the roadway or bed with tarred paper, or with lime, mortar, or hydraulic ce-
19 ment, laid over it about two inches in thickness, or with a cheap flooring, which may be also covered with tar, or any other preventive to moisture can be used for said foundation or support, the object and effect of such support or foundation being to prevent moisture from being absorbed from the ground by the wooden blocks. Said foundation or support is designated in said drawings by the letters *d d*.

In further carying out my invention I make use of two sets or series (*a a a b b b*) of wooden blocks. They are cut with parallel sides, lines, or surfaces from joists or timber about four inches square, or of

other suitable shape and dimensions in cross sections, the longer blocks *a a a* being made about eight inches in length, while the shorter blocks, or those represented at *b b b*, are formed about half the length of the other. These blocks are placed end upward upon said foundation or support, and are arranged both transversely and longtudinally, so that the [the] long and the short blocks shall be arranged alternately in each direction, or run as seen in the drawings.

Such an arrangement of them leaves cavities *c c c* between the said blocks, each of the said cells being bounded by four of the larger blocks, and having its bottom formed by one of the shorter
20 blocks. The upper ends of the long blocks, when thus placed together, present a chequered or tessalated appearance, and they will exhibit the open spaces arranged together in a similar manner. Into each of these cells a small quantity or layer of coarse salt may be put. These cells are filled up with small broken stone or coarse clean gravel, the whole being firmly rammed, so that the upper surface of the mass in each cell shall be firm and level.

Next mineral or vegetable tar or pitch is to be poured over the whole surface of the pavement and into the cells or cavities containing the broken stone or gravel, so as to penetrate entirely between the pieces of stone or gravel and cement them together.

The tar permeating into the squares containing the broken stone or gravel will cause the masses of the same to adhere firmly to the surrounding blocks, and will admit of expansion of the mass by the weight of the wheels of carriages in passing over them, such expansion serving to fill up the spaces, which might otherwise be made by shrinkage of the wooden blocks. In order to prevent the blocks from being forced below one another in some of my modes of constructing the pavement they may be pinned together with wooden pins extending from block to block. Instead of the broken stone and tar, any other suitable cementing material or cement may be employed
21 in the cells. I prefer, however, common tar or pitch and gravel, or broken stone, as such, in practice, has been found to operate to great advantage, and to be very durable in use, and to present a surface over which it is very difficult for a horse's foot to slip or slide, as it will on ordinary wooden pavement when its surface is wet or covered with mud. The shorter blocks *b b b* serve to uphold the masses of cement and stone in the cells or cavities, so as to prevent particles of the broken stone or gravel from working under the longer blocks, and thus upheaving them and causing inequalities in the pavement; and when such masses are compacted by any blow upon them, or the rolling of wheels over them, instead of being pressed down, so as to slide down between the blocks, they are made to spread laterally and thereby completely close up the joints between the blocks and themselves, so as to prevent water from passing down into the joints between the blocks. As the salt will slowly melt it will penetrate into the wood and aid in preserving it from decay. My invention may be carried out in another form; that is to say, as seen in Fig. 1 and Fig. 3, Drawing No. II. The long blocks may be

arranged side by side and in rows transversely of the roadway, and with spaces about one inch in thickness between each two
22 rows of them, in each of which spaces a strip of board may be introduced edgewise or verticle, the width of the board being equal to about half the length of the block. These boards, being made to rest on the foundation or support resting on the surface of the ground, create with the rows of the blocks long cells or grooves, extending transversely across the roadway, such cells or grooves being subsequently filled with broken stone or gravel and tar or cement. I would remark, as to the great durability of my pavement, that for the purpose of experiment I have had some of it in use for six years before the month of March, eighteen hundred and fifty-four, on a road over which the travel has been very great.

Some of the advantages of my improved pavement are to be found in the hold that it offers to the feet of horses, in the little noise that is produced by carriages in passing over it, the absence of noise resulting from the peculiar character of the materials of which the pavement is composed. This pavement is also very durable; its durability being occasioned by reason of the friction of the travel over it, being produced upon the slightly elastic extremities of the fibres of the wooden blocks. Moisture is excluded from the
23 wood by the materials employed for the support of the blocks, also by the preventives; also by the tarry covering which is placed over the top surface as hereinbefore described. My pavement has the advantage of great cleanliness in comparison with most other pavements, because, in the first place, as there is very little wear of its upper surface, very little dust is likely to form upon it, and such as does form is quickly removed therefrom by rains and winds.

Having thus fully described the parts and combination of parts and the operation of my improved wooden pavement, and shown various modes in which the same may be constructed and made to operate without changing the principle of its construction and operation; what I claim therein as my invention, and desire to secure by letters patent is, the so combining or arranging the foundation or support (or its equivalent) of said wooden pavement resting on the roadway surface or bed, substantially as herein described, with said long and short blocks above described, (or their equivalents,) which said blocks are combined in such manner as that partitions shall be made, leaving cells or channels between them, with a wooden bottom formed by the shorter blocks some distance above the lower end of the
24 longer blocks for the reception of the broken stone or gravel and tar or other like material; and also combined with such cells or channels filled with broken stone, gravel, and tar, or other like material, substantially as herein described, having such wooden bottom to rest upon substantially as herein described, whereby the particles of pounded stone or gravel are prevented from working under the lower ends of the longer blocks, and whereby water is prevented from passing from the surface of the pavement downward through the joints of said wooden blocks; and also moisture is prevented from

being absorbed upwards from the ground by said wooden blocks, substantially as herein described.

SAMUEL NICOLSON.

Witnesses:
STEPHEN A. GOODWIN.
DANIEL GOODWIN, JR.

Endorsed: Filed Nov. 9, 1864. Wm. H. Bradley, cl'k.

25 Circuit Court.—In chancery, Oct. term, A. D. 1864.

Bond for costs.

SAMUEL NICOLSON
vs.
THE CITY OF CHICAGO. } In chancery.

UNITED STATES OF AMERICA,
Northern District of Illinois, ss:

I enter myself security for costs in this cause, and promise to pay all costs which may accrue to the opposite party in this action, or to any of the officers of this court; and in default of payment by the plaintiff of any costs ordered or adjudged to be paid by him, hereby agree and stipulate that execution may issue against my property for any costs taxed against him.

Dated this fifth day of November, A. D. 1864.

SAMUEL S. GREELY.

Endorsed: "Filed Nov. 9th, A. D. 1864. Wm. H. Bradley, clerk."

26 Whereupon, on this day, to wit, the ninth day of November, A. D. 1864, a writ of subpœna issued out of the said clerk's office against the said defendant in the said entitled cause, which said writ, together with the return of the marshal thereon, is in the words and figures following, to wit:

Subpœna.

UNITED STATES OF AMERICA,
Northern District of Illinois, ss:

The United States of America to the city of Chicago, greeting:

We command you that you appear before our judges of our Circuit Court of the United States of America, for the northern district of Illinois, at Chicago, in said district, on the first Monday in the month of December next, to answer the bill of complaint of Samuel Nicolson, this day filed in the clerk's office of said court, in said city of Chicago, then and there to receive and abide by such judgment and decree as shall then or thereafter be made, upon pain of judgment being pronounced against you by default.

To the marshal of the northern district of Illinois to execute.

27 Witness the Hon. Roger B. Taney, Chief Justice of the Su-

preme Court of the United States of America, at Chicago aforesaid, this ninth day of November, in the year of our Lord one thousand eight hundred and sixty-four, and of our independence the eighty-ninth.

[SEAL.] WM. H. BRADLEY, *Clerk.*

[50-ct. U. S. rev. stamp.]

Memorandum.

The above-named defendant is notified that unless it shall enter its appearance in the clerk's office of said court, at Chicago aforesaid, on or before the day to which the above writ is returnable, the complaint will be taken against it as confessed, and a decree entered accordingly.

WM. H. BRADLEY, *Clerk.*

I have served the within subpœna upon "The City of Chicago," the defendant therein named, by delivering a true copy of said subpœna to Frank C. Sherman, the mayor of said city of Chicago, on this 10th day of November, A. D. 1864.

J. R. JONES, *U. S. Marshal.*
By A. B. COTES, *Deputy.*

Endorsed: Filed Dec. 5th, A. D. 1864. Wm. H. Bradley, clerk.

28 And on this day, to wit, the third day of December, A. D. 1864, came the said defendant, by Francis Adams, its solicitor, and filed in the said clerk's office its appearance in the said entitled cause, which said appearance is in the words and figures following, to wit:

In the Circuit Court of the United States.

Appearance.

SAMUEL NICOLSON
vs.
THE CITY OF CHICAGO. } Bill in chancery.

UNITED STATES OF AMERICA,
Northern District of Illinois, ss:

The appearance of "The City of Chicago," the defendant in the above-entitled cause, is hereby entered in said cause.

FRANCIS ADAMS,
Def't's Sol'r.

Endorsed: Filed Dec'b. 3d, 1864. Wm. H. Bradley, cl'k.

29 And on this day, to wit, the fifth day of December, A. D. 1864, came the said defendant, by B. F. Ayer, its solicitor, and filed in the said clerk's office its appearance in the said entitled cause, which said appearance is in the words and figures following, to wit:

Circuit Court of the United States in and for the said northern district of Illinois.

Appearance.

SAMUEL NICOLSON
vs.
THE CITY OF CHICAGO. } In chancery.

UNITED STATES OF AMERICA,
Northern District of Illinois, ss:

I hereby enter my appearance for the defendant in the above-entitled cause.

B. F. AYER,
Solicitor for Defendant.

Endorsed: "Filed Dec. 5, 1864. Wm. H. Bradley, cl'k."

30 And on this day, to wit, the thirteenth day of March, A. D. 1865, came the said defendant, by Francis Adams, its solicitor, and filed in the said clerk's office its answer in the said entitled cause, which said answer is in the words and figures following, to wit:

31 Circuit Court of the United States, northern district of Illinois.—In chancery.

Answer.

The answer of the city of Chicago, defendant to the bill of complaint of Samuel Nicolson, complainant.

This defendant, saving to itself all right of exception to the manifold errors and insufficiences of the said complainant's bill of complaint, and praying the same benefit on the hearing hereof as though it had demurred to the said bill, for answer thereto, or to so much thereof as this defendant is advised and believes it is material or necessary to answer, saith:

32 This defendant admits that it is a municipal corporation, created, existing, and domiciled as alleged in complainant's bill of complaint. And defendant, further answering, denies that complainant was the original and first inventor of the said supposed invention and discovery, described in the schedule attached to complainant's said bill of complaint, and claimed by the said complainant, and denies that the complainant was the original and first inventor of the said supposed new and useful improved wooden pavement, and denies that the said supposed invention and discovery was, at the time of complainant's application for the said original letters patent, new and useful. But, on the contrary, defendant avers the truth to be, that all the material and substantial parts of the complainant's alleged new and useful improved wooden pavement, by him claimed as new, and the combination and arrangement of the said parts, and the said supposed invention and discovery had been invented and discovered long before complainant's said applica-

tion for said original letters patent, and long before his said supposed invention and discovery.

And this defendant further answering says, that the said supposed new and useful improved wooden pavement, and all the material and substantial parts thereof claimed by complainant as new, and the combination of the said parts, had been discovered by certain
33 persons in England, as hereinafter set forth, long before the application of complainant for his said original letters patent, and before his said supposed discovery and invention thereof; and that letters patent were granted by her majesty, Queen Victoria, in pursuance of the laws of England, for the said supposed invention and discovery of the complainant, to the persons at the time, and numbered as follows, to wit:

Letters patent, numbered 8,041, to David Stead, bearing date the 23rd day of April, in the second year of the reign of her Majesty Queen Victoria, the same being, to wit, the 23rd day of April, A. D. 1839, for "An improved mode or method of making or paving public streets and highways, and public and private roads, paths, courts, and bridges, with timber or wooden blocks."

Letters patent, numbered 8,657, to Thomas Wood, the younger, bearing date the 7th day of October, in the fourth year of the reign of her Majesty Queen Victoria, the same being, to wit, Oct. 7th, A. D. 1840, for "Improvements in paving streets, roads, bridges, squares, paths, and such like ways."

Letters patent, numbered 9,410, to John Perring, bearing date July 7th, A. D. 1842, for "Improvements in wood paving."

34 Letters patent, numbered 8,940, to Osborne Reynolds, bearing date the 27th day of April, in the fourth year of her Majesty Queen Victoria, the same being, to wit, the 27th day of April, A. D. 1841, for "Improvments in paving streets, roads, and ways."

Letters patent, numbered 9,640, to Joseph Crannis and Robert Kemp, bearing date the 21st day of February, in the sixth year of her Majesty Queen Victoria, the same being, to wit, the 21st day of February, A. D. 1843, for "Certain improvements in wood paving."

Letters patent to Richard Love, junior, numbered 11,466, and bearing date the 1st day of December, in the tenth year of the reign of her Majesty Queen Victoria, the same being, to wit, the 1st day of December, A. D. 1846, for "Certain improvements in paving streets, roads, yards, and other surfaces, over which carriages and beasts of burden have to pass."

Letters patent, numbered 8,473, to William Grimman, bearing date the 15th day of April, in the third year of her Majesty Queen Victoria, the same being, to wit, the 15th day of April, A. D. 1840, for "A new mode of wood paving."

Letters patent to Henry Austin, numbered 9,737, and bearing
35 date the 25th day of May, in the sixth year of the reign of her Majesty Queen Victoria, the same being, to wit, the 25th day of May, A. D. 1843, for "Improvements in wood pavements, floorings, and veneers."

And defendant, further answering, says that the aforesaid patentees and each of them did, in pursuance of the laws of England, in such

Circuit Court of the United States in and for the said northern district of Illinois.

Appearance.

SAMUEL NICOLSON
vs.
THE CITY OF CHICAGO. } In chancery.

UNITED STATES OF AMERICA,
Northern District of Illinois, ss:

I hereby enter my appearance for the defendant in the above-entitled cause.

B. F. AYER,
Solicitor for Defendant.

Endorsed: "Filed Dec. 5, 1864. Wm. H. Bradley, cl'k."

30 And on this day, to wit, the thirteenth day of March, A. D. 1865, came the said defendant, by Francis Adams, its solicitor, and filed in the said clerk's office its answer in the said entitled cause, which said answer is in the words and figures following, to wit:

31 Circuit Court of the United States, northern district of Illinois.—In chancery.

Answer.

The answer of the city of Chicago, defendant to the bill of complaint of Samuel Nicolson, complainant.

This defendant, saving to itself all right of exception to the manifold errors and insufficiences of the said complainant's bill of complaint, and praying the same benefit on the hearing hereof as though it had demurred to the said bill, for answer thereto, or to so much thereof as this defendant is advised and believes it is material or necessary to answer, saith:

32 This defendant admits that it is a municipal corporation, created, existing, and domiciled as alleged in complainant's bill of complaint. And defendant, further answering, denies that complainant was the original and first inventor of the said supposed invention and discovery, described in the schedule attached to complainant's said bill of complaint, and claimed by the said complainant, and denies that the complainant was the original and first inventor of the said supposed new and useful improved wooden pavement, and denies that the said supposed invention and discovery was, at the time of complainant's application for the said original letters patent, new and useful. But, on the contrary, defendant avers the truth to be, that all the material and substantial parts of the complainant's alleged new and useful improved wooden pavement, by him claimed as new, and the combination and arrangement of the said parts, and the said supposed invention and discovery had been invented and discovered long before complainant's said applica-

tion for said original letters patent, and long before his said supposed invention and discovery.

And this defendant further answering says, that the said supposed new and useful improved wooden pavement, and all the material and substantial parts thereof claimed by complainant as new, and the combination of the said parts, had been discovered by certain
33 persons in England, as hereinafter set forth, long before the application of complainant for his said original letters patent, and before his said supposed discovery and invention thereof; and that letters patent were granted by her majesty, Queen Victoria, in pursuance of the laws of England, for the said supposed invention and discovery of the complainant, to the persons at the time, and numbered as follows, to wit:

Letters patent, numbered 8,041, to David Stead, bearing date the 23rd day of April, in the second year of the reign of her Majesty Queen Victoria, the same being, to wit, the 23rd day of April, A. D. 1839. for "An improved mode or method of making or paving public streets and highways, and public and private roads, paths, courts, and bridges, with timber or wooden blocks."

Letters patent, numbered 8,657, to Thomas Wood, the younger, bearing date the 7th day of October, in the fourth year of the reign of her Majesty Queen Victoria, the same being, to wit, Oct. 7th, A. D. 1840, for "Improvements in paving streets, roads, bridges, squares, paths, and such like ways."

Letters patent, numbered 9,410, to John Perring, bearing date July 7th, A. D. 1842, for "Improvements in wood paving."

34 Letters patent, numbered 8,940, to Osborne Reynolds, bearing date the 27th day of April, in the fourth year of her Majesty Queen Victoria, the same being, to wit, the 27th day of April, A. D. 1841, for "Improvments in paving streets, roads, and ways."

Letters patent, numbered 9,640, to Joseph Crannis and Robert Kemp, bearing date the 21st day of February, in the sixth year of her Majesty Queen Victoria. the same being, to wit, the 21st day of February, A. D. 1843, for "Certain improvements in wood paving."

Letters patent to Richard Love, junior, numbered 11,466, and bearing date the 1st day of December, in the tenth year of the reign of her Majesty Queen Victoria, the same being, to wit, the 1st day of December, A. D. 1846, for "Certain improvements in paving streets, roads, yards, and other surfaces, over which carriages and beasts of burden have to pass."

Letters patent, numbered 8,473, to William Grimman, bearing date the 15th day of April, in the third year of her Majesty Queen Victoria, the same being, to wit, the 15th day of April, A. D. 1840, for "A new mode of wood paving."

Letters patent to Henry Austin, numbered 9,737, and bearing
35 date the 25th day of May, in the sixth year of the reign of her Majesty Queen Victoria, the same being, to wit, the 25th day of May, A. D. 1843, for "Improvements in wood pavements, floorings, and veneers."

And defendant, further answering, says that the aforesaid patentees and each of them did, in pursuance of the laws of England, in such

case made and provided, and after the issuing of the said patents to them, and each of them, respectfully execute certain instruments in writing, under their hands and seals respectively, particularly describing and ascertaining the nature of their said several inventions, and the manner in which the same and each of them were to be performed. and caused the said instruments in writing to be enrolled in her said Majesty's High Court of Chancery, in pursuance of the laws of England, in such case made and provided; and the said instruments in writing, commonly called specifications, were numbered as follows, and enrolled at the following dates, to wit:

Specification of David Stead, enrolled the 23rd day of August, A. D. 1839, numbered 8,041.

Specification of Thomas Wood, the younger, numbered 8,657, enrolled the 25th day of May, A. D. 1842.

36 Specification of John Perring, numbered 9,410, enrolled the 7th day of January, A. D. 1843.

Specification of Osborne Reynolds, numbered 8,940, enrolled the 27th day of October, A. D. 1841.

Specification of Joseph Grannis and Roberet Kemp, numbered 9,640, enrolled the 21st day of August, A. D. 1843.

Specification of Richard Love, numbered 11,466, enrolled the 1st day of June, A. D. 1847.

Specification of William Grimman, numbered 8,473, enrolled the 12th day of October, A. D. 1840.

Specification of Henry Austin, numbered 9,737, enrolled the 25th day of November, A. D. 1843.

The number of which said several specifications correspond with the numbers of the letters patent, issued and granted as aforesaid, to the said several patentees, and which said several specifications contain particular and definite descriptions of the said inventions, for which patents of corresponding numbers were granted as aforesaid.

37 And this defendant avers that the said letters patent and each of them were issued and granted for, and the specifications corresponding with the same and each of them, and enrolled as aforesaid, described and claim as the inventions and discoveries of the said several patentees, all the material and substantial parts of the said supposed invention and discovery of the said complainant, and the combination and arrangement of the said parts; and that the said supposed invention and discovery of the said complainant, was in fact invented and discovered by the said patentee, and described and set forth hy them and each of them in their said several specifications; and that letters patent, as aforesaid, were granted to them, and each of them for the said supposed invention and discovery of the complainant.

And this defendant says that the aforesaid specifications, numbered as aforesaid, to wit, 8,041, 8,657, 9,410, 8,940, 9,640, 11,466, 8,473, 9,737, and containing, as aforesaid descriptions of complainant's alleged invention, were printed and published in England long before the said supposed discovery by complainant of the said invention claimed by him, to wit, at the said several times when the said specifications were enrolled as aforesaid.

And defendant, further answering, avers that the said alleged
38 invention of complainant, and certain substantial and material parts thereof claimed as new by complainant, had long anterior to the supposed discovery thereof by the complainant been discovered in a certain public work, entitled "Specifications of patents," to wit, in volume 93 of said public work, in specification numbered 9,266, dated and enrolled August 22, 1842, and purporting to describe a certain invention of one Osborne Reynolds; also in volume 95 of said work, in specification numbered 9,410, enrolled January 7th, 1843, and purporting to contain the description of certain "Improvements in wood paving," invented by one John Perring; also in volume 97 of said work, in specification numbered 9,640, and enrolled August 23rd, 1843, and purporting to contain a description of "Certain improvements in wood paving," claimed to have been invented before said last-mentioned time by Joseph Crannis and Robert Kemp; also in volume 98 of said public work, in the specification numbered 9,737, enrolled November 25th, 1843, and purporting to contain a description of "Improvements in wood pavements, flooring, and veneers," claimed to have been invented before said last-mentioned time by one Henry Austin.

And the defendant, further answering, says that the said alleged
39 invention of complainant had been described in a certain other public work, long anterior to the supposed discovery thereof by complainant, to wit, in the Mechanics' Magazine, published at London, in England, in volume 39 of said public work, and upon the following pages, to wit, page 262, 264, also page 446, also page 269, also page 414; also in other public works and printed publications published in Europe and the United States.

And defendant, further answering, denies that the said supposed invention of complainant was not, at the time of complainant's application for his said original letters patent, in public use or on sale with complainant's consent or allowance; but, on the contrary, defendant says that long before complainant's said application, to wit, for six years before said time, to wit, from the 19th day of July, 1848, continuously, until the time of said application, the said supposed invention and discovery had been in public use, with the consent and allowance and knowledge of complainant, on a certain avenue generally known as the Mill-dam, which said avenue is a continuation of Beacon Street, in the city of Boston in the State of Massachusetts, and connects the said city with the city of Roxbury, in said State, and its immediate vicinity; and also that the said supposed invention and
40 discovery had been in public use, with the consent and allowance and by the procurement of complainant, for more than two years before his said application for letters patent, to wit, for six years before said time, to wit, on the western avenue of the Boston and Roxbury mill corporation near Beacon Street, Boston, in the State of Massachusetts.

And this defendant says, that a road constructed in all respects in conformity with the complainant's description of his said invention, was constructed by complainant on the said western avenue and was open to public use and travel to wit, on the 19th day of July, 1848,

with the consent and allowance of complainant, and was so used continuously from said last-mentioned date until the time of complainant's said application for letters patent.

And this defendant, further answering, says that the complainant, at the time of constructing and opening to public use and travel, as aforesaid, the said roads constructed as aforesaid, was the superintendent of said Boston and Roxbury mill corporation, and was a stockholder in said corporation, and received remunerations from the said corporation for the construction of the said roads on the said mill dam and on the said western avenue, and for constructing and allowing the same to be publicly used and travelled upon; also
41 devided profit to himself, as a stockholder in said corporation, from the said construction and public use of said road, and so defendant says that the said complainant, before his said application for letters patent, to wit, for more than two years before said application, had abandoned and dedicated to public use his said supposed invention.

And defendant, further answering, says that the said supposed invention of complainant was long before complainant's application for said letters patent, to wit, for more than two years before said time, in public use in the city of Boston, Massachusetts, with the consent and allowance of complainant.

And this defendant, further answering, says it has no knowledge, and cannot state upon information and belief, whether the said complainant made application for said letters patent, or was duly sworn to the specifications for that purpose, or complied with all the conditions of the acts of Congress in such case made and provided, as alleged in the complainant's bill, but defendant admits, upon information and belief, that on the 8th day of August, 1854, complainant obtained, and there were issued to him, letters patent, sealed, signed, and countersigned, as alleged by complainant, and
42 securing to complainant, in the manner and for the time alleged in said bill his supposed invention, a description whereof was purported to be given in the schedule annexed to said letters and making a part of the same. And as to the allegation contained in complainant's bill of complaint, that the description contained in said schedule was a legal description, and that the said drawings and written references in said schedule contained were in due form of law, this defendant says that the same are allegations of law to which defendant is not bound to make answer, but submits the same to this hon. court.

And defendant, further answering, say that it has no knowledge, but has been informed and believes, that, to wit, December, 1, 1863, complainant made a formal surrender of his original letters patent, and that at said last-mentioned date, the same were cancelled, and that a new patent (a copy of which, without the drawings, is annexed to complainant's bill) was issued to the complainant; and defendant denies that the said original letters patent, were surrendered in conformity with the law in such case made and provided, and denies that the same were surrendered for the purpose of procuring a new

patent for the said supposed invention described and claimed
43 in the specifications annexed to the said original letters patent, and making part of the same, and denies that the description and specification in the schedule annexed to said new letters patent describe the said supposed invention originally patented, as aforesaid. and point out in what the same consists in more clear, full, and exact terms than was done in the schedule or specification annexed to and making a part of said original letters patent, and denies that the said original letters patent were legally cancelled.

And defendant, further answering, says that the original letters patent were not surrendered in conformity with law, and that the same were not inoperative or invalid by reason of a defective or insufficient discription or specification, and that there was no error in said original description or specification arising by inadvertancy, accident, or mistake. And defendant charges and submits to this hon. court, that the said original letters patent were surrendered fraudulently and illegally, and that there is a clear repugnancy between the said original letters patent and the said new letters patent, and that the said original letters patent and the said new letters patent are not for the same, but for wholly distinct and different, inventions, and that the said new letters patent are void and of no force or
44 effect whatever.

And defendant, further answering, denies that the said original letters patent were surrendered, and the said new letters patent obtained, for the purpose of giving in the specifications annexed to said new letters patent a more correct and accurate description of the said supposed invention, or for the purpose of connecting any error in said original specification arising from inadvertancy, accident, or mistake; but, on the contrary, avers that the said original letters patent were surrendered fraudulently, and for the purpose of fraudulently changing the complainant's claim to the said supposed invention and discovery in such manner as to wrongfully and illegally intimidate and exclude this defendant and the public generally from the use of wooden pavements commonly known aud publicly used and described in printed publications, and public works, long before the application of complainant for his said original letters patent, to wit, for more than two years before said application.

And this defendant, further answering, says it has no knowledge information or belief, except as hereinbefore set forth, as to whether the said complainant or others claiming under him, have used
45 the said supposed invention in different parts of the country, or whether the same has been extensively used in the department of art to which it belongs; or whether the complainant would have derived to himself greater profit from the said supposed invention, but for alleged illegal interference with his supposed rights.

And defendant denies that the complainant is entitled to any exclusive enjoyment or possession whatever of the said supposed invention, and denies that complainant's alleged rights in the premises are of any value whatever.

And defendant, further answering, denies that the validity of complainant's said patent has become settled or established by his use of the said supposed invention, or by the acquiescence of the public in his exclusive use and enjoyment of the said supposed invention, and in the validity of said patent, or in any other way.

But, on the contrary, this defendant avers that complainant's title to the said supposed inventing purported to be secured by the said letters patent, has never been established in any way, and that the same has never been acquiesced in by this defendant; and defendant says that heretofore, to wit, December 9, 1862, complainant commenced in this honorable court an action at law against this defendant,
46 for an alleged infringement of complainant's said original letters patent, to which said action this defendant appeared and made defence, and that such proceedings were had, that afterwards, and when the issues in said action were fully made up, the said complainant dismissed his said action and paid the costs of the same; and this defendant says that complainant has never established his said supposed letter in any court of law, and defendant expressly denies the validity of the said patent.

And this defendant, further answering, denies that defendant at any time since the said first day of December, 1863, has made, constructed, or used the said supposed improvement in wooden pavements in the said reissued letters patent mentioned, or has caused the same to be made, constructed, or used in the said city of Chicago or elsewhere, in any manner or for any purpose whatever, or has made, constructed, or used, or caused to be made, constructed, or used, wooden pavements upon the plan or principle or in imitation of or embracing the said supposed invention and improvement of complainant; and denies that defendant is now or since the filing of the said bill has been using or constructing or causing to be used or constructed the said supposed invention and improvement.

And this defendant denies all unlawful combination and con-
47 federation in said complainant's bill charged; without this, that any other matter or thing material or necessary for this defendant to make answer unto and not herein or hereby well and sufficiently answered, confessed, and avoided or traversed and denied, is true to the knowledge or belief of this defendant.

All which matters and things this defendant is ready and willing to aver, maintain, and prove, as this honorable court shall direct, and humbly prays to be hence dismissed with its reasonable costs and charges in this behalf most wrongfully sustained.

[SEAL] F. C. SHERMAN, *Mayor.*
S. S. HAYES, *City Comptroller.*
Attest: Pr. CHAS. C. CHASE, *Ch'f Cl'k.*
H. W. ZIMMERMAN, *City Clerk.*
FRANCIS ADAMS, *Sol'r.*

{ 5 cent revenue stamp. }
{ H. W. Z., Feb. 23, 1865. }

Endorsed: Filed March 13th, 1865. Wm. H. Bradley, cl'k.

48 And on this day, to wit, the thirteenth day of March, A. D. 1865, came the said complainant, by his solicitors, and filed in the said clerk's office his replication in the said entitled cause, which said replication is in the words and figures following, to wit:

United States Cir. Ct., northern dis. Ills.

Replication.

SAMUEL NICOLSON
vs.
CITY OF CHICAGO. } In chancery.

The replication of Samuel Nicolson, complainant, to the answer of the city of Chicago, defendant.

This repliant, saving and reserving to himself, now and at all times hereafter, all and all manner of benefit and advantage of exception which may be had or taken to the manifold insufficiencies of the said answer for replication thereunto, says that he will aver, main-
49 tain, and prove his bill of complaint to be true, certain, and sufficient in the law to be answered unto; and that the said answer of the said defendant is uncertain, untrue, and insufficient to be replied unto by this repliant; without this, that any other matter or thing whatsoever in the said answer contained material or effectual in the law to be replied unto, and not herein and hereby well and sufficiently replied unto, confessed, and avoided, traversed or denied, is true, all which matters and things this repliant is and will be ready to aver, maintain, and prove, as this honorable court shall direct, and humbly prays as in and by his said bill he has already prayed.

GOODWIN, LARNED & GOODWIN,
Sol'ls for Comp't.

Endorsed: Filed March 13th, 1865. Wm. H. Bradley, cl'k.

50 And on this day, to wit, the seventeenth day of March, in the adjourned March term, A. D. 1865, of said court, in the record of the proceedings thereof, in the said entitled cause, is the following entry, to wit:

Record Entry.

SAMUEL NICOLSON
vs.
CITY OF CHICAGO. } Chancery.

On motion of the complainant, by his solicitors, it is ordered by the court that Daniel Goodwin, jr., esq., be, and he is hereby, appointed an examiner, under the amended sixty-seventh rule in equity of the Supreme Court, to take proofs herein.

51 And on this day, to wit, the fourteenth day of June, in the adjourned May term, A. D. 1865, of said court, in the record of the proceedings thereof, in the said entitled cause, is the following entry, to wit:

Record entry.

SAMUEL NICOLSON
vs.
THE CITY OF CHICAGO. } Chancery.

By agreement of the parties by their solicitor's, the time is extended until the first day of September next, to take testimony generally, with leave to the complainant to take rebutting testimony thereafter until the first Monday of October next, if he shall so elect

52 And on this day, to wit, the fifth day of December, in the adjourned October term, A. D. 1865, of said court, in the record of the proceedings thereof, in the said entittled cause, is the following entry, to wit:

Record entry.

SAMUEL NICOLSON
vs.
THE CITY OF CHICAGO. } Chancery.

Now comes the complainant, by his solicitors, and on his motion, and with the consent of the defendant's counsel, it is ordered by the court that this cause be set down for hearing on the pleadings, proofs, and exhibits on file herein.

53 And on this day, to wit, the twenty-first day of February, A. D. 1866, in the December term, A. D. 1865, of said court, in the record of the proceedings thereof in the said entitled cause, is the following entry, to wit:

Record entry.

SAMUEL NICOLSON
vs.
THE CITY OF CHICAGO. } Chancery.

This cause having heretofore been set down for hearing upon the pleadings, exhibits, and proofs on file herein, now come the parties by their solicitors, and after hearing a part of the proofs, the hour of adjournment having arrived, the further hearing is postponed, by agreement, to Friday morning next.

54 And on this day, to wit, the twenty-third day of February, A. D. 1866, in the December term, A. D. 1865, of said court, in the record of the proceedings thereof, in the said entitled cause, is the following entry, to wit:

Record entry.

SAMUEL NICOLSON
vs.
THE CITY OF CHICAGO. } Chancery.

Now come again the parties by their solicitors, and after hearing the concluding evidence, the hour of adjournment having arrived, the arguments of counsel are postponed until to-morrow morning.

55 And on this day, to wit, the twenty-fourth day of February, A. D. 1866, in the December term, A. D. 1865, of said court, in the record of the proceedings thereof, in the said entitled cause, is the following entry, to wit:

Record entry.

SAMUEL NICOLSON
vs.
THE CITY OF CHICAGO. } Chancery.

Now come again the parties by their solicitors, and after hearing a part of the arguments of counsel, the hour of adjournment having arrived, the further hearing of the cause is postponed until Monday morning next.

56 And on this day, to wit, the twenty-sixth day of February, A. D. 1866, in the December term, A. D. 1865, of said court, in the record of the proceedings thereof, in the said entitled cause, is the following entry, to wit:

Record entry.

SAMUEL NICOLSON
vs.
THE CITY OF CHICAGO. } Chancery.

Now come again the parties by their solicitors, and after hearing the arguments of counsel until the hour of adjournment, without concluding the same, the further hearing is postponed until to-morrow morning.

57 And on this day, to wit, the twenty-seventh day of February, A. D. 1866, in the December term, A. D. 1865, of said court, in the record of the proceedings thereof, in the said entitled cause, is the following entry, to wit:

Record entry.

SAMUEL NICOLSON
vs.
THE CITY OF CHICAGO. } Chancery.

Now come again the parties, by their solicitors, and, after hearing additional arguments of counsel until the hour of adjournment,

without concluding the same, the further hearing is postponed until to-morrow morning.

58 And on this day, to wit, the twenty-eighth day of February, A. D. 1866, in the December term, A. D. 1865, of said court, in the record of the proceedings thereof, in the said entitled cause, is the following entry, to wit:

Record entry.

SAMUEL NICOLSON
vs.
THE CITY OF CHICAGO. } Chancery.

Now come again the parties, by their solicitors, and after hearing additional arguments of counsel until the hour of adjournment, without concluding the same, the further hearing is postponed until to-morrow morning.

59 And on this day, to wit, the first day of March, A. D. 1866, in the December term, A. D. 1865, of said court, in the record of the proceedings thereof, in the said entitled cause, is the following entry, to wit:

Record entry.

SAMUEL NICOLSON
vs.
THE CITY OF CHICAGO. } Chancery.

Now come again the parties, by their solicitors, and after hearing the concluding arguments of counsel, the court not being fully advised in the premises, takes the same under advisement.

60 And on this day, to wit, the twenty-seventh day of July, in the July term, A. D. 1866, of said court, in the record of the proceedings thereof, in the said entitled cause, is the following entry, to wit:

Record entry.

SAMUEL NICOLSON
vs.
THE CITY OF CHICAGO. } Chancery.

This cause having heretofore been brought to a hearing upon the pleadings and proofs therein, and having been argued by Messrs. Goodwin and Larned on the part of the complainant, and by Messrs. Martin and Adams on the part of the defendant, and due deliberation being had thereon by the court, it is now, at this day, ordered, adjudged, and decreed, and this court by virtue of the power and authority therein vested, doth hereby order, adjudge, and decree:

First. That the re-issued letters patent, granted to the said Samuel Nicolson, dated the first day of December, in the year one thou-

sand eight hundred and sixty-three, and numbered reissue No. 1,583 in the bill of complaint in this cause set forth, is valid, and
61 that the said Samuel Nicolson thereby became vested with the exclusive right in the said reissued letters patent granted, as in said bill alleged and claimed.

Second. That the defendant, The City of Chicago, a municipal corporation, created and existing by and under the laws of the State of Illinois, and domicilled within the northern District of Illinois, hath disturbed, violated, and infringed upon the said complainant in his exclusive rights under said reissued letter patent aforesaid, as in said bill set forth.

Third. That the said complainant is entitled to an account from the defendant, The City of Chicago, of the value of the said complainant's exclusive patent right as a patent or license fee upon each and every square yard of the said complainant's improved wooden pavement, constructed or laid by the said defendant since the first day of December, in the year one thousand eight hundred and sixty-three, as the gains and profits had and received by the said defendant, in consequence of the infringements and violation of the exclusive rights of the complainant, which it is adjudged have
62 been so committed by the defendant.

Fourth. That it be, and is hereby, referred to Henry W. Bishop, jr., esquire, one of the masters of this court, to compute, ascertain, and state an account of the value of the said complainant's patent right as aforesaid, as a patent or license fee upon each and every square yard of the said complainant's improved wooden pavement, constructed or laid by the said defendant since the date of the said reissued letters patent aforesaid, and up to the date of said report, as the gains and profits had and received by the said defendant, and hereinbefore adjudged to the said complainant in consequence of the infringements aforesaid; and the said master is directed to take the proofs and report the same to this court, together with his finding and opinion thereon, of the amount due from said defendant to said complainant with all convenient speed, and he is hereby authorized to require the production of all books of account and papers in the hands of the said defendant or its officers or agents touching the matter of this reference, and also to examine the
63 complainant and the officers and agents of the said defendant on oath touching the same, and the evidence already taken in said cause, may also be used on said reference, and such other testimony may be taken to be used on said reference under the amendment to the 67th rule in equity in this court, as either party may desire; and all further directions are reserved until the coming in of the said report.

And on this day, to wit, the twelfth day of October, in the
64 adjourned October term, A. D. 1866, of the said court, in the record of the proceedings thereof, in the said entitled cause, is the following entry, to wit:

Record entry.

SAMUEL NICOLSON
vs.
THE CITY OF CHICAGO. } Chancery.

On motion of the complainant by his solicitor, and in the absence of Henry W. Bishop, jr., esq., the master to whom this cause was referred, it is ordered by the court that the complainant have leave to take the testimony to be used before said master before James T Ely, esq., a commissioner of this court.

And on this day, to wit, the twelfth day of November, in
65 the adjourned October term, A. D. 1866, of said court, in the record of the proceedings thereof, in the said entitled cause, is the following entry, to wit:

Record entry.

SAMUEL NICOLSON
vs.
THE CITY OF CHICAGO. } Chancery.

Now comes the complainant by his solicitor, who files the report of Henry W. Bishop, jr., the master herein, of the damages due in this cause, and also the evidence, which said report of Henry W.
Bishop, jr., the master, of the damages due in this cause,
66 together with the evidence taken to be used before him, and which were duly filed in the said clerk's office, on the twelfth day of November, A. D. 1866, are in the words and figures following, to wit:

Circuit Court of the United States, northern district of
67 Illinois.

Report of master.

SAMUEL NICOLSON
vs.
THE CITY OF CHICAGO. } In chancery.

In pursuance of an order of said court, entered in said cause on the 27th day of July, A. D. 1866, by which, among other things, it was referred to the undersigned, a master in chancery of said court, to compute, ascertain, and state an account of the value of the said complainant's patent right as a patent or license fee upon each and every square yard of the said complainant's improved wooden pavement, constructed or laid by the said defendant since the date of the reissued letters patent (described therein) up to the date of this report, as the gains and profits had and received by the said defendant, and the amount due from said defendant to said complaint, hereby reports:

That, on the 8th day of November, A. D. 1866, I was at-
68 tended by Mess. Goodwin and Larned, solicitors for the complainant, S. A. Irwin, esq., the solicitor for defendant,

having been notified to appear also, but failing to do so; and the said solicitors for complainant having produced before me the testimony of A. W. Tinkham, A. M. Hirsh, and Samuel Nicolson, which was taken before J. T. Ely, as examiner, in pursuance of another order in said cause, to be used by the master in making his report, also all the other testimony taken upon the part of the complainant herein: and I find and report:

1st. That, from said evidence, it appears that the value of the complainant's patent right as a patent or license fee upon each and every square yard of the said complainant's improved wooden pavement, constructed or laid by the said defendant since the date of the said reissued letters patent up to this time, and which are the gains and profits had and received by the said defendant for said time, is sixteen (16) cents for each and every square yard thereof.

Second. That during said time, that is to say, from the time
69 of reissuing of said letters patent to the date of this report, the said defendant has laid or constructed eighty-five thousand eight hundred and fifteen and 43-100 square (85,815.43) yards of said complainant's improved pavement.

Third. That there is due and owing from said defendant to said complainant the sum of twenty-nine thousand seven hundred and thirty dollars and thirty cents ($29,730 30,) for which sum a decree should be entered.

All of which is respectfully submitted.

Dated Nov. 8, 1866.

HENRY W. BISHOP, JR.,
Master in Chancery of Circuit Court of United States for Northern District of Illinois.

[5 ct. U. S. Rev. stamp.]

Endorsed: Filed Nov. 12th, 1866.

70 *Deposition of A. W. Tinkham.*

Be it remembered, that on application of Samuel Nicolson, the plaintiff in a suit now pending in the Circuit Court of the United States for the northern district of Illinois, wherein Samuel Nicolson is the plaintiff, and The City of Chicago is the defendant, I, James T. Ely, a U. S. commissioner in and for the northern district of Illinois, in the State of ———, have, this Tuesday, the twenty-third day of October, A. D. 1866, at the office of Goodwin & Larned, in the city of Chicago and district aforesaid, due notice to the said defendant, having been given, proceeded to examine A. W. Tinkham as witness on behalf of the said plaintiff in the aforesaid suit; and I certify that the reason for taking said deposition is, and the fact is, that the same was taken by the consent of the parties to the said suit, and their counsel respectively; and I do further certify, that the said Messrs. Goodwin and Larned appeared before me on the said day, on behalf of the said plaintiff, and S. A. Irwin, esq., as counsel on behalf of the said defendant; and that the said A. W. Tinkham, being by me care-

fully examined, cautioned, and duly sworn to testify the whole truth, says :

71 1 Q. What is your name?

A. A. W. Tinkham.

2 Q. What is your age?

A. Forty-two years.

3 Q. Where is your residence?

A. Chicago.

4 Q. What is your occupation?

A. Secretary of the board of public works.

5 Q. How long have you been secretary of the board of public works?

A. Since its organization, in 1861.

6 Q. State in detail all places in which the wooden block-pavement, known as the Nicholson pavement, has been laid in the city of Chicago, giving in such statement the name of the street or alley, specifying the portion of the same laid; also, the engine-houses, approaches to bridges, and all other places where the same has been laid in said city, giving the time when each piece was laid as nearly as possible.

A. 1. Lake street, from Wabash ave. to the bridge, in 1861. It is admitted that this piece has been paid for.

2. Lake street, from Wabash ave. to Central ave., in 1862. Also paid.

3. South Water street, from Franklin to Lake, in 1862. Also paid.

72 4. South Wells street bridge approaches, north and south, in 1862. Also paid.

7 Q. Please state, in that connection, at what rate it was paid.

A. It is a sum total.

A. 5. Intersection of Clark and Randolph streets, in 1863.

6. Intersection of Clark and Madison streets, in 1863, on which we have a guarantee from the agent of the patentee, Mr. Greely, that there shall be no more than ten cents per square yard paid.

"OFFICE OF THE BOARD OF PUBLIC WORKS,
"*Chicago, July*, 1863.

"Whereas I have made a contract with the city of Chicago to lay for them a Nicholson pavement on the intersection of Clark and Madison streets, I hereby guarantee them against all demands for pay thereon over and above ten (10) cents per yard for each square yard of surface therein so paved.

"SAMUEL S. GREELY,
"*Agent for Samuel Nicholson.*"

A. 7. West Lake street, from West Water street to Halstead street, in 1863–'64.

7½. Floor of Long John engine-house, in 1864.

73 8. Wells street, from Madison street to Van Buren street, in 1865.

9. Wolcott street, from Kinzie street to Michigan street, in 1865.
10. Wabash ave., from Randolph street to 22nd street, in 1865–'66.
11. Michigan street, from Cass street to Clark street, in 1865.
12. Dearborn street, from Madison street to Monroe street, in 1865.
13. West Randolph street, from Halstead street to West Water street, in 1866.
14. South Water street, from Clark to Franklin streets, in 1865–'66.
15. South Water street, from Wabash ave. to Michigan ave., in 1865.
16. West Madison street, from Halstead street to the bridge, in 1866.
17. The east half of Calhoun place, block 56, original town, in 1866.
18. Van Buren street, from State street to the river, in 1866.
19. Wells street, from Van Buren street to Taylor street, in 1866.
20. Wells street, from Lake street to South Water street, in 1866.
21. Van Buren street, from State street to Michigan ave., in 1866.

74 22. Canal street, from Madison street to Lake street, in 1866.

23. Washington street, from State street to Michigan ave., in 1866.
24. Sherman street, from Van Buren street to Harrison street, in 1866.
25. Griswold street, from Van Buren street to Polk street, in 1866.

On looking over the above, I find that I have omitted the following pieces: North approach to Rush-street bridge, in 1866. Floor of Island Queen engine-house, probably in 1864.

A. W. TINKHAM.

Subscribed and sworn to before me this 23d day of Oct., 1866.

[SEAL.] JAMES T. ELY,
U. S. Com. Nor. Dist. Ill.

75 And I do further certify that the preceding deposition, taken on application of the said plaintiff in a suit now pending in the Circuit Court of the United States for the northern district of Illinois, wherein Samuel Nicolson is plaintiff and the city of Chicago is defendant, was reduced to writing by me, and signed separately by the said A. W. Tinkham, in my presence, and that I am not of counsel or attorney for either of the parties to said suit, nor am I interested in the event thereof.

Witness my hand and notarial seal this twenty-third day of October, A. D. 1866.

[SEAL.] JAMES T. ELY,
U. S. Com'r Nor. Dist. Ill.

Endorsed: "Filed Nov. 12, 1866. Wm. H. Bradley, cl'k."

76 *Deposition of A. M. Hirsch.*

Be it remembered that on application of Samuel Nicolson, the plaintiff in a suit now pending in the Circuit Court of the United States for the northern district of Illinois, wherein Samuel Nicolson is the plaintiff and the city of Chicago is the defendant, I, James T. Ely, a U. S. commissioner in and for the northern district of Illinois, have this Tuesday, the thirteenth day of October, A. D. 1866, at the office of Goodwin & Larned, in the notice to the said city of Chicago and district aforesaid due notice to the said defendant having been given, proceeded to examine A. M. Hirsch as witness on behalf of the said plaintiff in the aforesaid suit, and I certify that the reason for taking said deposition is, and the fact is, that the same was taken by consent of the parties to the said suit and their counsel, respectively; and I do further certify that the said Messrs. Goodwin and Larned appeared before me on the said day, on behalf of the said plaintiff, and S. A. Irwin, esq., as counsel on behalf of the said defendant, and that the said A. M. Hirsch, being by

77 me carefully examined, cautioned, and duly sworn to testify the whole truth, says:

1 Q. What is your name?

A. A. M. Hirsch.

2 Q. What is your age?

A. Thirty-nine years.

3 Q. Where do you reside?

A. Chicago.

4 Q. What is your occupation?

A. Assistant engineer of the public works.

5 Q. How long have you been in the employ of the board of public works as assistant engineer?

A. I have been in the employ of the board of public works since soon after its organization.

6 Q. State in detail all places in which the wooden block pavement, known as the Nicholson pavement, has been laid in the city of Chicago, giving in such statement the name of the street, alley, engine-house, bridge-approach, &c.; the time when each piece was laid, and also the number of square yards in such pavements, superficial measurement, in each piece of pavement so laid.

A. The first Nicholson pavement, to my knowledge, was laid on Wells street, from Lake to South Water; I believe it was in 1857.

78 7 Q. Will you state how much that contained?

A. That contained 1,690 67-100 yards. The second was in Washington street, between Lasalle street and Clark street, and contained 1,707 square yards. This was paved in 1858. The third one was in Clark street, from Polk to Randolph, in 1858-'59, and contained 24,551 square yards. Then the next one was on Clark street, from Randolph to Lake, in 1859, and contained 2,091 square yards. All this was done before the organization of the board of public works. I believe that is all that was done, to my knowledge or to my recollection. Since the organization of the board of public

works, the first was on Lake street, from Wabash ave. to the bridge, and contains 16,263 square yards. The next on Lake street, from Wabash ave. to Central ave., contains 3,340 1-10 square yards.

3. South Water street, from Franklin street to Lake street, 3,125 33-100 square yards.

4. Wells street bridge-approaches, I am not positive, but I give it as 375 square yards.

5. Intersection of Clark and Randolph streets, 597 32-100 square yards.

79 6. Intersection of Clark and Madison streets, 567 square yards.

7. West Lake street from West Water street to Halstead street, 14,868 45-100 square yards.

7½. Floor of Long John engine-house, 355 square yards.

8. Wells street from Madison to Van Buren, 10,256 67-100 square yards.

9. Wolcott street, from Kinzie to Michigan streets, 1,065 33-100 square yards.

10. Wabash ave, from Randolph street to 22nd street, 67,311 square yards.

11. Michigan street, from Cass street to Clark street, 6,742 99-100 square yards.

12. Dearborn street, from Madison street to Monroe street, 2,667 55-100 square yards.

13. West Randolph street, from Halstead street to West Water street, estimated 16,766 square yards. This may may be more or less than the estimate.

14. South Water street, from Clark street to Franklin street, 5,755 5-10 square yards.

15. South Water street, from Wabash ave. to Michigan ave., 1,704 37-100 square yards.

17. Part of Calhoun Place, 414 square yards.

16. West Madison street, from Halstead street to the bridge, 13,206 67-100 square yards.

80 18. Van Buren street, from State street to the river, 11,130 43-100 square yards.

19. Wells street, from Van Buren street to Taylor street, 11,514 square yards.

20. Wells street, from Lake street to South Water street, 2,349 33-100 square yards.

21. Van Buren street, from State street to Michigan ave., 1,580 22-100 square yards.

22. Canal street, from Madison street to Lake street, 6,798 79-190 square yards, as estimated.

23. Washington street, from State street to Michigan ave., 4,109 8-10 square yards.

24. Sherman street, from Van Buren street to Harrison street, 2,542 2-10 square yards, as estimated.

25. Griswold street, from Van Buren street to Polk street, estimated at 4,172 5-10 square yards.

8 Q. State whether you have been employed by the city during the year 1865 or 1866 to prepare estimates of the probable cost of laying the pavement on any of the streets in the city, for the purpose of making such estimates the basis of an appraisal of damages, and whether, in making up such estimates of costs in any way, what sum has been taken into account as the amount of royalty or tariff which the city may have to pay to the patentee?

A. I have made estimates during that time for the improvement of streets with the wooden block pavement, so-called "Nich-
81 olson," and I was not instructed, in making those estimates, to make any reservation for the patentee, but it has happened that the contractors always bid below the estimated prices, and in making the final assessments we reserved money enough, in case the city should be obliged to pay for the patent, we would have money on hand to do so.

9 Q. State what amount you allow for such reservation for the patentee.

A. Well, in making those final assessments we generally allowed, I believe, sixteen (16) cents per yard.

By Mr. Irwin:

10 Q. In making estimates for the improvement of the streets, did you not generally intend to have them rather larger than the actual contract prices for such improvement, rather than smaller? In other words, did you not seek to have them a little over than under the cost?

A. Yes, sir; I always did, and so does every engineer in making estimates, to have enough money on hand, for it is better to refund some money, if there is a balance left, than to make a second
82 assessment and collect a second time. People don't like it. It is customary with all engineers to make the assessment high enough to cover all contingencies.

The following pieces, I find on examination, were omitted in the previous list:

26. Approaches to Rush street bridge, paved in 1866, contains 1,082 square yards.

27. Island Queen engine-house, on West Lake street, containing $192\frac{83}{100}$ square yards.

28. Alley on the north and west sides of the post office, containing $738\frac{6}{10}$ square yards. This alley has been paved by private individuals. Mr. Robert Stewart executed that piece of work.

In my statement of the amount laid prior to the organization of the board of public works, I omitted the following pieces:

1. Alley, and block 38, original town, containing 628 square yards.

2. Three-quarters of the alley and block 16, original town, containing 390 square yards.

3. Alley and block 19, original town, containing 558 square yards.

4. Central ave., from South Water street to Lake street, containing 1,728 square yards. These last four items are admitted to
83 have been all paid for. This was between 1858 and 1860;

[add] west 70 feet of Couch Place, block 35, original town, 124 square yards.

The actual amounts may vary a little from the amounts given, either more or less.

The amount above estimated for Wabash ave. is less than the actual amount, in consequence of some returns of intersections on new streets, which have not been included.

A. M. HIRSCH.

Sworn and subscribed to before me this twenty-third day of October, A. D. 1866.

[SEAL.]

JAMES T. ELY,
U. S. Com., Nor. Dist. Ill.

And I do further certify, that the preceding deposition, taken on application of the said plaintiff in a suit now pending in the Circuit Court of the United States for the northern district of Illinois, wherein Samuel Nicholson is plaintiff and the city of Chicago is defendant, was reduced to writing by me, and signed separately by the said A. M. Hirsch, in my presence; and that I am not of counsel or attorney for either of the parties to said suit, nor am I in-
84 interested in the event thereof.

Witness my hand and notarial seal, this twenty-third day of October, A. D. 1866.

[SEAL.]

JAMES T. ELY,
U. S. Com. Nor. Dist. Ill.

Endorsed: "Filed Nov. 12, 1866. WM. H. Bradley, cl'k."

85 *Deposition of Samuel Nicholson.*

Be it remembered that on application of Samuel Nicholson, the plaintiff, in a suit now pending in the Circuit Court of the United States for the northern district of Illinois, wherein Samuel Nicolson is the plaintiff and The City of Chicago is the defendant, I, James T. Ely, a U. S. commissioner in and for the northern district of Illinois, have this Saturday, the thirteenth day of October, A. D. 1866, at the office of Goodwin & Larned, in the city of Chicago and district aforesaid, due notice to the said defendant having been given, proceeded to examine Samuel Nicolson, plaintiff, in said suit, as witness on behalf the said plaintiff in the aforesaid suit, and I certify that the reason for taking said deposition is, and the fact is, that the same was taken by consent of the parties to the said suit, and their counsel respectively; and I do further certify that the said Messrs. Goodwin and Larned appeared before me, on the said day, on be-
half of the said plaintiff, and S. A. Irwin, esq., as counsel
86 on behalf of the said defendant; and that the said Samuel Nicolson, being by me carefully examined, cautioned, and duly sworn to testify the whole truth, says:

1 Q. What is your name, age, residence, and occupation?

A. My name is Samuel Nicolson, and am seventy-four years of age. I will be seventy-five this fall. I reside in Massachusetts. I have no special occupation except looking after my interests in this patent.

2 Q. Are you the complainant in this suit, and the inventor of the Nicolson pavement?

A. I am.

3 Q. State how long the said pavement has been in use and on sale in the market since the patent was taken out.

A. My patent is dated on the 8th of August, 1854; it has been in use since the date of the patent.

4 Q. State whether during that time there has been an established price or license fee for the use of said pavement per square yard; and if so, state what such license fee has been.

A. There has been; and the rate has been sixteen cents per square yard of superficial measurement.

87 5 Q. State what license fee per square yard was paid in the city of Chicago prior to the time of their infringing upon that patent, and for how long.

A. Sixteen cents, and for about five years—nearly five years.

6 Q. Give instances of the different places and persons within the last ten years with whom contracts to lay the pavement for the license fee of 16 cts. per square yard have been made.

A. In Milwaukee the contract was for 16 cts. per square yard, paid by the contractors with my agent, Mr. Greely; (the names of those contractors I now forget;) that was during those five years I believe since Mr. Greely was acting as my agent.

7 Q. What five years were those?

A. I think it was the five years preceding the commencement of this suit; and since then I had contracts with Mr. Eugene Robinson, of Detroit for the pavement. I charged 16 cts. per square yard on all pavements put down in the city of Detroit, and in other cities and towns within the State of Michigan. I also made arrange-

88 ments in the city of Fort Wayne, with contractors there, under their city agent, or their city engineer, Gilkerson, for paving there at the rate of 16 cts. per square yard. This in Fort Wayne was within the last two years. Mr. Robinson has recently been paving Kalamazoo, Michigan, and has recently settled with me, during the last week, for the paving at the rate of 16 cts. per square yard. He is now paving on Lafayette street, in the city of Detroit, and is to pay me at the rate of 16 cts. per square yard. I also made arrangements with Mr. Dawley, now of New York city, that he may do paving in Baltimore, Md., and in Utica, N. Y., by paying me my established royalty of 16 cts. per square yard. I also made arrangements and entered into contracts with Mr. Jonathan Taylor, for paving in the city of New York and the city of Brooklyn, at 16 cts. per square yard; and he is to pay me at that rate for paving in those two cities. I also made arrangements with Mr. Taylor for pavement now being laid in Elmira, New York, for which he is to pay me, when that is done, at the rate of 16

89 cts. per square yard. I also contracted with Mr. Charles E.

Jenkins of New York, that he may do paving in Philadelphia, Penn., by paying me my established royalty of 16 cts. per square yard; and I have entered into contract with Mr. Jenkins that he may do the paving in the city of Washington at 16 cts. per square yard in all the streets of that city, except Pennsylvania avenue, upon which I am to receive 20 cts. per square yard. I also made arrangements with Colonel Clark for paving in Harrisburg and Williamsburg, Penn'a, and two other cities in Pennsylvania, (the names of which I have not the papers here now to give you,) and also in Buffalo, N. Y., for which he is to pay me 16 cts. per square yard upon all done in those cities which I have named. Those are all the places that I can now bring to mind where there have been any contracts for paving and working. I also made arrangements with Mr. Jonathan Taylor for paving in the city of New Orleans next winter, (this coming winter,) at the rate of 16 cts. per square yard; and also in the cities of Savanna, Mobile, and Charleston, at the rate of 16 cts. per square yard; and also in the city
90 of Havanna, (if you choose to go out of the country,) for the same royalty. I also had a large number of correspondents in various portions of the country asking my terms, and I have invariably written that my established rates of royalty was 16 cts. per square yard; that I always stated verbally and by letter to everybody.

8 Q. State what license ever was charged by you to the city of St. Louis for laying the city pavement; and if any abatement or discount was made to them, state upon what grounds the same was made?

A. I have a contract with the city of St. Louis. After they had made a successful experiment with the pavement, they then proposed to contract with me for a license to lay the pavements as extensively as they might choose in the city, and to use their own workmen; and they proposed to me that they would assume the collection of all the dues of royalty. I said to them that my established price was sixteen cents per square yard; they told me that they did not deal in square yards there, but in squares of ten feet instead of square yards
91 of nine feet, and that they preferred to have a contract drawn in that manner, and they did not want it drawn at the rate of sixteen cents per square yard of nine feet—they wanted it drawn at the rate of a square of ten feet; and they proposed, if I would make it for the sum of one dollar and fifty cents for a square of ten feet, that they would make all the collections, and that it should be passed to my credit on the books of the city treasurer, and that I should have authority to draw directly upon him; that it was to be taken out of the first receipts of the property holders; and, after deliberation, I concluded it would be for my interest to have no care of the paving, and I concluded to accept one dollar and fifty cents for a square of ten feet, that abatement being as a compensation for my receiving the cash without trouble. At that time my assessments had come from Chicago chiefly, and Mr. Greely had all the annoyance of that, but there had been great delays, and in one instance, of the paving of Clark street, I did not get my money for one or

92 two years; then I received city bonds, on which I received a satisfactory interest; and ever since my contract with St. Louis they have been very punctual and prompt in paying whenever I asked for money, and have sent me certified certificates of the amount of paving up to the period; and I should be perfectly willing to make contracts like that with all the cities in the U. S. I should be perfectly willing to make one with Chicago to day on the same terms.

9 Q. State, in that connection, how soon, and when, you are entitled to your pay in your contracts with St. Louis?

A. As soon as the jobs are finished and measurements made I am entitled to my pay.

Cross-examination.

By Mr. Irwin:

10 Q. In what cities and towns, and to what extent, had your pavement been laid prior to the filing of the bill by you in this suit?

93 A. There had been pavements laid in Boston; all the pavements in Boston was laid prior to 1864. I cannot give you the gross amounts definitely. In round numbers, I should say there had been about half a mile paved in Boston. Then I permitted a man to lay an amount in Memphis, Tennessee in 1860, and I think he had it completed in 1861. He had a great deal of trouble to get it down, and for that I never received anything. I think he wrote to me he put down something over a square from three to five hundred feet in extent. It was all down in Milwaukee prior to this suit. I should think there must have been fully, or more, than a mile of it in Milwaukee. There was a good deal put down in St. Louis before the suit; between one and two miles of it. The first that was put down in Michigan was put down since the suit—a year ago last summer, ni June, in Detroit. I cannot bring to my mind any put down before the suit, except those I have mentioned. I gave them a right to put down part of a street in Toledo as an experiment, by way of introduction, two years ago, for which I made no charge. I can-

94 not call to mind anything else that took place in relation to it previous to this suit.

11 Q. In what, if any, cases have you settled for less than 16 cents per square yard, or agreed to take less, other than at St. Louis?

A. I never agreed for any royalty in any place for less than sixteen cents, except in St. Louis, nor have I ever settled for less. I mean of course, that that was the royalty to the purchaser, not my receipts, exclusive of expenses.

12 Q. In charging sixteen cents per square yard in the cases mentioned, what, if anything, have you calculated for expenses of collection, &c.?

A. In some cases my expenses have amounted to about six cents per square yard, but not in all. In other cases there has been no expenses at all. There is no abatement in any of the contracts I have made with Mr. Taylor, nor with Mr. Jenkins, or Col. Clark or Mr. Dawley; with them I make no abatement for commissions. It has

to nett me the amount of sixteen cents per square yard, they paying all expenses.

13 Q. In the case of Mr. Greely, of this city, what, if any, commission or abatement upon 16 cents per square yard did you allow?

95 A. I never allowed him anything more than six cents per square yard, neither for what he did in this city or Milwaukee, or any other city; I believe he did nothing in any other city than Milwaukee and Chicago. There is this thing, in St. Louis the first introduction of the pavement was made by Mr. Greely, and my impression is that I made no charge of royalty at all for that which was done merely as a specimen pavement, and upon which was predicated the contract made subsequently by myself in that city.

14 9. Am I to understand you, then, that in the case of all pavements laid down through the arrangement of Mr. Greely you, in fact, received but ten cents per square yard?

A. That was the amount I received from him.

96 *Direct examination resumed.*

By Mr. Larned:

15 Q. In all these cases through Mr. Greely, I understand you to say that the market price to the city, or party using the patent, was invariably not less than sixteen cents per square yard, and that out of that price you paid to your agent, Greely, all over ten cents of such price for his aid and services to you in introducing the patent and superintending the laying?

A. That is it, unless in cases where I gave it, as already stated by me. I gave my permission to use it in two places without charging anything.

16 Q. Did your contract with Mr. Greely include the cities of Chicago and Milwaukee?

A. It did.

17 Q. State what Mr. Greely was to do, and the character of his services for which you agreed to allow him six cents of your patent fee?

A. He was to use all exertions in his power for the laying of the pavement in any of the Western cities, and to see that it was
97 properly put down according to my patent, for which he was to be compensated in the manner before named.

18 Q. Was he to be at all the expenses of that agency himself?

A. He was.

19 Q. State whether, beside that, by your arrangement, he was to pay one-half of the expenses of any suit brought against him, or necessary to be brought for infringing the patent, in those districts?

A. He was.

20 Q. State if you made any contract with any one in 1860; and if so, with whom, with respect to the pavement in New Orleans and in San Francisco, and what license fee was to be reserved or charged, under such contract, for the pavement.

A. I did make a contract with Mr. McBean of Chicago. I think his name was Alexander, and I was to give him the same terms that Mr. Greely was to have here for using his best exertions in San Francisco and New Orleans, and he did go to both those places, though he did'nt effect anything. The license fee was to be not less than sixteen cents invariably, and he was to receive all over ten cents as compensation for his exertions and expenses.

98 *Cross-examination resumed.*

By Mr. Irwing:

21 Q. Was the contract with Greely in writing? and if so, can you produce it?

A. The contract was in writing; it is not here; it is in Boston. It was in duplicate, and Mr. Greely had one part.

22 Q. The contracts with the other parties named, were they or were they not in writing? and can you produce any of them?

A. They were in writing; I have none of them here with me; they are in Boston.

23 Q. Were they in duplicate also?

A. No, sir; they were not; they were special licenses; they have them; they hold them. They were licenses to lay down the pavement in certain territory, and upon certain terms; that is, my licenses to Clark and Jenkins and Dawley; the other to Taylor is in the shape of a letter, not reduced to a license, any other than a promise to give him a license as soon as he gets his contracts.

24 Q. Were they to receive the same compensation as Mr. Greeley?

A. No, sir; they were to pay me outright sixteen cents per
99 square yard net, without any deduction.

SAMUEL NICHOLSON.

Sworn and subscribed to before me this thirteenth day of October, A. D. 1866.

[SEAL.]

JAMES T. ELY,
U. S. Com. Nor. Dist. Ill.

And I do further certify that the preceding deposition, taken on application of the said plaintiff, in a suit now pending in the Circuit Court of the United States for the northern district of Illinois, wherein Samuel Nicholson is plaintiff and The City of Chicago is defendant, was reduced to writing by me, and signed separately by the said Samuel Nicholson in my presence; and that I am not of counsel or attorney for either of the parties to said suit, nor am I interested in the event thereof.

Witness my hand and notarial seal, this thirtieth day of October, A. D. 1866.

JAMES T. ELY,
U. S. Com'r Nor. Dist. Ill.

100 Endorsed: Filed Nov. 12th, 1866. Wm. H. Bradley, cl'k.

101 And on this day, to wit, the seventh day of January, A D. 1867, in the December term, A. D. 1866, of said court, in the record of the proceedings thereof, in the said entitled cause, is the following entry, to wit:

Record entry.—Decree.

SAMUEL NICHOLSON
vs.
THE CITY OF CHICAGO. } Chancery.

This cause coming on this day to be heard upon the equity reserved therein, and upon the report of Henry W. Bishop, jr., master in chancery, filed on the twelfth day of November, eighteen hundred and sixty-six, and bearing date the eighth day of November one thousand eight hundred and sixty-six, to whom it was referred by the decree of this court, to compute and ascertain the value to the defendant of the use of the patent invention of the said complainant in the bill in this cause set forth, being the gains and profits thereof to the defendant, and the damages to the complainant; and Messrs. Goodwin and Larned, solicitors for complainant, and S. A. Irving,
102 esq., city solicitor for defendant, being present in open court, pursuant to notice, thereupon, on reading the said report heretofore filed as aforesaid, and hearing Messrs. Goodwin and Larned for said complainant, and said S. A. Irving, esq., for said defendant, and no exceptions having been made or filed by either party to said report, it is ordered, adjudged, and decreed, and this court, by virtue of the power and authority therein vested, doth order, adjudge, and decree, that the said report and all things therein contained do stand ratified and confirmed; and it is further ordered, adjudged, and decreed that the said defendant, The City of Chicago, do pay unto the said Samuel Nicholson the said sum of twenty-nine thousand seven hundred a nd thirty dollars and thirty cents ($29,730 30) so reported by the said master, as the amount due to the said complainant, as aforesaid, with interest thereon from the date of the said report, together with the costs of this suit,
103 to be taxed, and that the said complainant do have execution therefor, according to the course and practice of this court; and it is further ordered, adjudged, and decreed, that the said defendant, The City of Chicago, their agents, servants, and contractors, be perpetually enjoined and restrained by the injunction of this court from constructing or causing to be constructed in said city, during the running or lifetime of the said reissued letters patent of the said Samuel Nicholson, any wooden pavement upon the plan, principle, and arrangement of the said complainants, and as described in said bill of complaint, and set forth in the pleadings and proofs in this cause, as heretofore made and constructed by said defendant, without the written license and permission of the said complainant, or his assigns or representatives, first had and obtained; but this decree shall not operate as such restraint until the issue and service of an injunction by the complainant.

104 On the hearing of said cause the complainant offered and read in evidence the following testimony and exhibits, to wit:

In the Circuit Court of the United States for the northern district of Illinois.

Deposition of S. S. Greely.

SAMUEL NICHOLSON
vs.
THE CITY OF CHICAGO. } In equity.

Deposition taken the tenth day of April, in the year of our Lord one thousand eight hundred and sixty-five, in the above cause, on the part and behalf of the complainant, before Daniel Goodwin, jr., special examiner.

B. A. Goodwin, esq., appears as counsel for the complainant, and Francis Adams, esq., and Edward Martin, esq., as counsel for the defendant.

The witness, Samuel S. Greely, was duly sworn by said examiner; and on being orally examined by the several counsel, deposed as follows, to wit:

First interrogatory. What is your name, age, occupation, and place of residence?

105 Ans. My name is Samuel S. Greely. I am forty years of age; am a civil-engineer by occupation. My residence is the city of Chicago, Illinois.

Complainant's counsel here offers in evidence "Exhibit A," which is marked accordingly, but is not hereto attached, being a certified copy of letters patent to Samuel Nicholson, dated August 9, 1854, No. 11,491, said copy being certified by D. P. Holloway, Commissioner of Patents, the fourth day of January, eighteen hundred and sixty-four.

(Defendant's counsel here object to the introduction of said exhibit, on the ground that the same is irrelevant, and that the certificate contains an unexplained erasure in the date.)

Complainant's counsel here offer in evidence complainant's "Exhibit B," marked accordingly, but not attached, the same being a certified copy of letters patent, reissued to Samuel Nicolson, Dec'r 1, 1863, No. 1,583, and duly certified by D. P. Holloway, Commissioner of Patents, on the fourth day of January, eighteen hundred and sixty-four.

(Defendant's counsel object to the introduction of "Exhibit B," for irrelevancy and incompetency.)

106 Complainant's counsel here offers in evidence a stipulation, which is hereto annexed and marked complainant's "Exhibit C," the same being signed by the respective solicitors for the complainant and defendant, dated April 8, 1865.

(Defendant's counsel objects to the introduction of "Exhibit C," as complainant's proof, on the ground that it was signed for the purpose of being filed for both parties, and ought to be treated as part of the files in this cause.)

Interrogatory second. Are you familiar with the specifications and claim of Mr. Nicolson's reissued letters patent, marked "Exhibit B?"

Answer. I have read them carefully and understand them.

Interrogatory third. How long have you resided in the city of Chicago?

Ans. Between eleven and twelve years.

Fourth. What has been your business and occupation here?

Ans. Surveying and civil engineering, and at times laying the Nicolson pavement.

Fifth. How long, and to what extent, have you been familiar with the pavement known as the Nicolson pavement?

107 Ans. I have known it since 1856. I have paved several blocks or squares of it.

Sixth. What connection, if any, have you had with that pavement? what interest in it, and what means of knowledge relating to it?

Answer. I have had several contracts for laying it. I had a contract for the exclusive use of the patent right in Chicago, Milwaukee, and St. Louis for five years, ending in the fall of 1863.

Defendant's counsel here asks the witness if the contract alluded to by him was in writing.

Answer. There were two contracts in writing, and they were the only contracts.

(Defendant's counsel objects to the parol testimony of any of the contents of those contracts, as contained in the answer of the witness to interrogatory sixth.)

Interrogatory seventh. State further what has been your means of knowledge relating practically to the laying, working, and durability of the Nicolson pavement, as described in his letters patent, original and re-issued?

108 I have frequently laid the pavement; have watched its wear in the street, and have frequently taken up portions of it for examination.

Interrogatory eighth. Have you read, or heard read, the description contained in Exhibit C, of the construction by the defendant of the wooden pavement on West Lake street, from the bridge to the west line of Halstead street, in the months of August, September, and October, in the year 1864, and of the wooden pavement laid on the engine-house floor, on the north side of west Lake street, in June, 1864; of the wooden pavement laid on the engine-house floor on La Salle street, in October, 1864?

Answer. I have read them.

Interrogatory ninth. State whether the wooden pavements in the last interrogatory mentioned, are constructed on the plan and principle contained and described in the complainant's re-issued letters patent of Dec. 1, 1863, marked "Exhibit B?"

(Deft's counsel objects to the interrogatory for the reason that the same is leading.)

Answer. They are.

109 Interrogatory tenth. Did you, in the course of the laying down and construction of that pavement, from the bridge to

Halstead street, yourself personally know and observe how it was constructed?

Ans. I saw it at times during its construction.

Interrogatory eleventh. Upon which of the two plans mentioned in Exhibit B was the same constructed—that described in drawing No. 1 or in drawing No. 2?

Ans. As in drawing No. 2.

Interrogatory twelve. Have you practically, also, in your experience, seen Nicolson's wooden pavement laid after the plan described in drawing No. 1?

Ans. I have.

Interrog. thirteen. State whether or not, from your acquaintance with the Nicolson pavement, and practical experience in regard to it, it realizes the advantages and effects claimed in the reissued letters patent marked Exhibit B? If yea, state what are those advantages and effects realized in the construction of the Nicolson wooden pavement?

110 (Def'ts counsel objects to the first clause of the question as leading.)

Answer. It is comparatively noiseless, and is cleanly and durable, excludes moisture and frost, and the parts as combined sustain each other. The composition of tar and gravel is sustained by the short block or the strip at the bottom of the cell or the groove, so that it cannot be forced through the opening, and cannot wash under the long block, and the pressure of the travel upon the cement in the cells or grooves tends to spread the mass of it and keep it firmly against the sides of the blocks, so as to exclude water from above. It offers an excellent foothold for horses' feet and prevents them from slipping. These are, I understand, the effects and advantages claimed in the patent.

Interrog. fourteen. You have stated in your last answer that the construction described by you prevents water from coming down from above; what portion of the construction of the wooden pavement prevents the moisture and frost referred to by you in your last answer?

Answer. The cement in the cells or grooves substantially excludes water from above; the flooring or its equivalent underneath

111 substantially excludes moisture from below; and the whole mass, being composed of non-conductors of heat, tends to exclude frost. I refer specially to the wood as being a non-conductor.

Interrog. fifteen. State your practical experience of the durability of said pavement.

Ans. I paved a part of South Wells street, between South Water and Lake street, in the years 1856 and 1857. It is still in use, after having sustained a heavy travel during that time; and with some repairs is likely to last two or three years longer.

Interrog. sixteen. Repairs to what extent?

Ans. The replacing of some of the blocks with new ones in places where they are most worn, and the putting of fresh tar and gravel on the surfaces and into some of the grooves.

Interrog. seventeen. What proportion of the blocks in that particular piece of pavement need replacing?

Ans. I have no definite idea, but estimate it at ten or fifteen per cent.

Interrog. eighteen. What would be the effect of the moisture
112 absorbed from below, of which you have spoken, if there were no flooring or its equivalent upon the lower ends of the blocks?

Answer. The alternate absorbtion of the moisture and drying would tend to produce rot.

Interrog. nineteen. What would be the effect of that?

Ans. The crumbling down and settlement of the pavement.

Interrog. twenty. State how, in your opinion and from your experience in regard to street pavements generally, the Nicolson wooden pavement compares with street pavements of other kinds and descriptions, with reference to the advantages in use and durability.

Answer. It is far superior in the points which I have named to the stone cobble pavement, and to the limestone block pavement as used in the city of Chicago. I think its durability much greater than that of the cobble pavement, and somewhat greater than that of the best imes tone block pavement as laid in Chicago.

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The counsel for the complainant rests his examination-in-
113 chief, and the counsel for the defendant cross-examined the witness, as follows:

First cross-interrogatory. When and where did you first read the alleged Nicolson's reissued letters patent?

Ans. I cannot say positively, but I think I read them in this city soon after their issue.

Second cross-interrog. When and where have you known the pavement in question to be laid?

Ans. In the city of Chicago, and in Milwaukee and St. Louis. I laid it myself. I have seen pavement on several streets in Boston, which its external appearance, I suppose to be the Nicolson pavement.

Third x-interrog. Did not Mr. Nicolson issue a pamphlet in relation to the subject of this pavement; and is not the document, marked "defendants Exhibit A," but not attached, a copy of that pamphlet?

Ans. He did issue such a pamphlet, and this is a copy of it.

Fourth x-int. When was that?

114 Answer. It is dated "1859," and I think that was the time it was issued.

Fifth cross-interrogatory. Do you regard the rot and effects referred to by you in your direct examination as serious impediments to the practical utility of a pavement without the flooring or its equivalent?

Ans. The rot is a strong impediment to the practical utility of any pavement wherever it occurs, and I think it more likely to occur without the flooring than with it.

Sixth x-int. Without such flooring or equivalent would not the moisture from below tend to produce rot?

Answer. It would if it was alternated with drying.

Seventh x-int. Would the alleged Nicolson pavement be of prac-

tical utility without the floor or its equivalent for the wooden blocks to rest upon?

Ans. A pavement laid without the floor or its equivalent would be of less value in the points named than one laid with the floor
115 or its equivalent. The pavement would have some practical utility, of course.

Cross-interrogatory eight. Would not the blocks sink with the pressure of travel and become out of place and useless in a very short time if there were no floor or its equivalent to sustain them?

Ans. They would be more likely to sink without the floor than with it. I do not think they would become valueless in a short time without it.

Ninth x-int. The question which you were asked was whether they would not sink and get out of place in a short time. Please answer that.

Ans. I never saw pavement so laid and do not know.

Tenth. Do you not know, as an expert civil engineer, that Fleet street, in the city of London, was paved with wooden blocks of all sorts and sizes, and that it was continually sinking through the mud and soil beneath, and always out of order and displaced for the want of a floor, or its equivalent, referred to?

116 Answer. I do not know how Fleet street was paved.

X-interrog. eleven. Would a pavement, laid according to Nicolson's plan, but without such flooring or its equivalent, be, in your judgment as a civil engineer, a practical and useful pavement for street purposes in a city like Chicago?

Ans. It would have a value, but would have less value than if it had a flooring or its equivalent.

X-interrog. twelve. Please to express your judgment in some terms of proportion.

(Complainant's counsel objects to this and all interrogatories of def't's counsel based upon the idea that the witness has been called as an expert.)

Answer. I could not give a definite proportion, but should guess that it might last half as long.

Cross-int. thirteen. Do you mean by that that it might have half the practical utility?

Ans. I don't know how to compare them in any definite proportion, except upon the basis of durability. One would pro-
117 nounce one pavement smoother or more agreeable or cleaner than another, but it would be difficult to say definitely whether one pavement was twice or three times or four times smoother or more agreeable or cleaner than another.

X-int. fourteen. What is the equivalent which you have referred to for the flooring?

Ans. Those named in Nicolson's patent.

X-int. fifteen. Was the pavement on Wells street, of which you have spoken, laid so as to produce grooves or cells?

Ans. So as to produce grooves.

X-int. sixteen. Do you know of any place where the pavement is laid so as to produce cells?

Ans. It was so laid in the intersection of Washington and Clark streets.

X-int. seventeeen. How much of it and was that the only place where you have known it done?

118 Ans. It was a space about forty-eight feet square, and that was the only place where I have seen it so laid; it was in the summer of 1858.

X-int. eighteen. How long did it remain, and how did it work?

Ans. It remained, I think, till the summer of 1864, when the blocks were taken up, and the long blocks were relaid in the groove form. It was not so smooth on the surface as that laid in the groove form, for the reason that the spaces between the blocks were somewhat too large; the surface of the cement in the cells became lower than the blocks, and the surface of the pavement was rough, something like a cobble pavement, but not so much so.

X-int. nineteen. In what manner do the parts of the Nicolson pavement sustain each other?

Ans. The flooring forms a foundation for the whole, substantially preventing an unequal settlement of the blocks; the short block or strip prevents the gravel from being pushed through the space, and working under the block; and the cement being compacted by the raining, and afterwards by the travel, is pressed firmly against the sides of the blocks, thus tending to keep them in position.

119 X-int. twenty. Are you acquainted with Austin's patent for street pavement?

(Objected to by compl't's counsel, on the ground that there is no proof of any such patent.)

(Defendant's counsel withdraws the last interrogatory.)

X-int. twenty-one. (21) Are you acquainted with a method for street pavement, known among civil engineers as the pavement of one Henry Austin?

(Compl't's counsel objects for the reason that the question assumes what is not proved in the case, that there is any such pavement known among civil engineers as Austin's.)

Ans. I have read the pamphlet describing a pavement, the title being Specification of Henry Austin, and understand the mode described there.

Cross-interrogatory twenty-two. What difference do you perceive as to silence, cleanliness, durability, facilities for the spread of cement and of the foothold for horses, between the mode de-

120 scribed in the Austin pamphlet, which you refer to, and the mode adopted by Mr. Nicolson?

(Compl't's counsel objects that that is not proper cross-examination.)

Ans. I think there would be very little difference except in point of durability; possibly, I think, as the gravel reaches down to the bottom of the block, that it might work under the blocks, and so tend to raise them. The Austin pavement is made without strips or short blocks in the spaces.

X-int. 23. You speak of your observation of the Nicolson pave-

ment; how closely have you observed the pavement which is laid in Chicago on Clark, Lake, Randolph, and Wells streets?

Ans. I see some of them most every day in passing over them. I generally see one or the other of them every day in riding over them.

X-int. 24. Do you know the mode of construction of the pavement on each of these streets respectively?

Ans. I do. There is no Nicolson pavement on Randolph
121 street, except at the crossing of Clark street, which is the road bed, about eighty feet square.

X-int. twenty-five. (25.) Do you know of the Austin pavement being laid anywhere on Clark st., Chicago?

Ans. I never saw it or heard of it, except in the pamphlet alluded to.

X-int. twenty-six. Taking Clark street, from Washington to Lake, is there any part of it which does not possess all the advantages which you have attributed to the Nicolson pavement?

Ans. None that I know of.

X-int. twenty-seven. If any part of it wanted those advantages, what opportunity would you have for knowing it between the points referred to?

Ans. I laid the pavement alluded to, as contractor, except the intersection of Randolph and Clark streets. I see and pass over the pavement frequently, but have made no critical examination.

X-int. twenty-eight. (28.) Are you acquainted with a method of wooden pavement, known among civil engineers as the wood
122 paving of Crannis & Kemp?

(Compl't's counsel objects that the question assumes what is not proved, than any such pavement as that referred to is or was ever known.)

Ans. I never heard such pavement mentioned among civil engineers.

X-int. twenty-nine. Have you not read a pamphlet containing a method of wooden paving, claimed therein to be the invention of Crannis & Kemp?

(Compl't's counsel makes same objection as last stated, and that it is immaterial and irrelevant.)

Ans. I don't remember having read it.

X-int. thirty. Point out all the essential difference, as a pavement, between what is called the Nicolson pavement and the Austin pavement.

(Compl't's counsel objects to the question as irrelevant and immaterial.)

Ans. The pavement described in the pamphlet, entitled "Austin's specification," I think, has a floor laid in sections, each sec-
123 tion being fastened together by cleets or glue, I think. Nicolson described his pavement as having a flooring of cheap boards, or an equivalent foundation, not laid in sections. Austin's pavement is described as having blocks fastened to the floor either by glue or by nails, without intermediate short blocks or strips. In Nicholson's pavement the blocks are set up on end on the floor,

without being fastened to it, and are held in place by contact with each other, or with the strips. In Austin's patent the groove containing the gravel and cement extends down to the bottom of the block. In Nicholson's patent the bottom of the cement is kept at a certain distance above the bottom of the blocks by the strip or short block underneath it. That is all that I remember of.

X-int. thirty-one. Is there any difference between the two methods in the setting the blocks upon end on the floor?

I don't remember any, except the fastening of the blocks, not having the pamphlet before me.

(Compl't's counsel objects to the question and answer for the same reason before stated.)

X-int. 32. Is the difference referred to in the flooring an
124 essential difference between the two methods in question? and if so, how is it essential?

(Compl't's counsel objects to the question as irrelevant, and it assumes what the witness has not said, that there was any difference in the flooring except as to the form in which it is constructed.)

Ans. There is a difference described in the method of laying the flooring. I don't know what the effect of flooring in sections would be, never having seen it tried.

X-int. thirty-three. Is the foundation of flooring or its equivalent an essential part of the wooden pavement of Nicolson?

Ans. It is described as being so in his patent.

X-int. thirty-four. Is it so or not in your judgment?

Ans. I think it is.

X-int. thirty-five. Do you know, and if so, state how far south from Randolph st. the wooden pavement extends which you call the Nicolson pavement?

Ans. As far south as Polk street, the north line of Polk st.

125 X-int. thirty-six. Do you know, and if so, state how the travel and use of pavement on the street at its intersection at Randolph street compares with the travel and use of the pavement at any point south of that?

Ans. I should think it was fully as much at Randolph as anywhere, perhaps more.

X-int. thirty-seven. What was the size of the cells at the intersection of Washington st., to which you have referred?

Ans. About four inches square and three inches deep.

X-int. thirty-eight. Do you mean that the blocks were square at the top at that place?

Ans. Yes, sir.

(Defendant's counsel rests, and the counsel for the complainant resumes his examination of the witness.)

Redirect examination.

Interrogatory twenty-one. Was there anything whatever said in that pamphlet of Austin's, referred to, about nailing the blocks to the floor?

Ans. My recollection was, that it said it was to be nailed or

cemented. (Witness, on being shown the pamphlet by com-
126 plainant's counsel referred to, says farther:) It only speaks of the blocks being glued or cemented to the floor.

Int. twenty-two. From what you recollect of the description of Austin's pavement in that pamphlet, and its mode of construction, would it be much more difficult and expensive in laying than the Nicolson pavement?

Ans. I should think it would be.

Int. twenty-three. Will you state in what respect it would be more difficult and expensive in construction than the Nicolson pavement?

Ans. It would be more expensive in making the flooring in compartments, glued, cemented, or keyed together. It would be expensive and very difficult to glue or cement the blocks to the flooring so strongly that they would not be displaced or disturbed in the subsequent operations of construction, in the operation of filling the spaces with gravel or tar, and also the carrying the blocks along on the street to continue the pavement.

Int. twenty-four. State what you mean particularly by carrying the blocks along to continue the pavement, and practically describe the relative inconvenience compared with the Nicolson.

127 Ans. In the Nicolson pavement, as soon as the blocks and strips are laid on any part of the street, teams can pass over them, bringing blocks and other materials, without materially disturbing the pavement, before the gravel and tar are put in, so that they can be unloaded at the end of the pavement where the pavers are at work. In the Austin pavement I should think the blocks, if only glued or cemented to the floor, would be very likely to be displaced by teams or by the workmen passing over them.

Int. twenty-five. Would it not be almost certain that they would be displaced and thrown down, if only cemented or glued, or even if nailed by a single nail, or even more?

(Def't's counsel objects to the question as leading.)

Ans. I should think it was.

Int. 26. How practically would the approach to the margin of the work from the other end of the street be?

Ans. The surface of the street must be shaped and prepared for the reception of the flooring somewhat in advance of the pavement. The passage of teams bringing blocks or other materials over this prepared surface would disturb it, and make it necessary to
128 grade it over in part; for this reason the work cannot be conveniently approached in front by teams with supplies or materials.

Interrogatory twenty-seven. Would these difficulties and inconveniences, and consequent expense of constructing the Austin wooden pavement, render it an impracticable and undesirable pavement for common uses?

(Def't's counsel objects to the question as leading.)

Ans. I should think they would be likely to.

Int. twenty-eight. Can you form any approximate estimate of the comparative durability of the Austin pavement, when once thus constructed, compared with the Nicolson pavement?

Ans. I should think it would be nearly as durable, when once built, in the Austin pavement, if the blocks were loosened from the flooring, as they might be by the jar of the travel over it. The gravel at the bottom of the groove might work under the blocks in some places, and so tend to raise them and make the pavement uneven. This might make the Austin pavement somewhat less durable than the Nicholson pavement.

Int. 29. Practically, and in your experience, how do you
129 regard the Nicolson pavement, compared with other stone pavements spoken of in your examination in reference to the cost of construction?

Ans. The Nicolson pavement, I think, costs in this city about twenty per cent. more than the cobble pavement, and about the same as the limestone block pavement.

Int. thirty. Which do you regard, the Nicolson or the cobble stone, as in the end the most economical?

(Def't counsel objects to the question for the reason that it does not call for rebutting testimony.)

Ans. I think the Nicolson pavement is the most economical in the end, because the most durable.

Int. thirty-one. How long ago was the pavement intersecting Randolph on Clark laid down?

Ans. It was either one or two years ago this spring, I forget which.

Int. thirty-two. Do you recollect that it was laid down after the controversy between Nicolson and the city of Chicago about the Nicolson patent?

130 Ans. It was laid after that controversy arose.

Int. thirty-three. Do you recollect hearing at the time that they were talking of putting down a portion of that after the Austin patent, the pamphlet of which they had then got?

(Deft's counsel objects that the question calls for hearsay evidence, and is leading.)

Ans. I don't recollect of ever hearing so at all.

Recross-examination by defendant's counsel.

Re-x 1. Was the intersection of Randolph street laid while you held any claim or interest in the alleged Nicolson patent?

Ans. No; it was after my interest expired.

Re-x 2. Suppose that the Austin method were used upon a flooring of common boards, like those used in Chicago, and that the blocks were placed close together, longitudinally across the street, as they are in the Nicolson pavement, leaving a groove of about an inch only between the rows of blocks, and that instead of being glued or or cemented, the blocks were simply nailed to the flooring
131 with one or two nails; would such a pavement be much more expensive to lay than the Nicholson pavement?

Ans. That would not be the Austin pavement as described in the pamphlet.

(Deft's counsel objects to the above portion of witness, answer as being irresponsive to the question.

A pavement so laid would be more costly, I think, than the Nicolson pavement, because of the liability of the blocks to become easily displaced in construction, and because of the cost of fastening the block to the flooring, which is not required in Nicolson's method.

Re-x-int. three. In constructing the Nicolson pavement, how far are the blocks usually laid before they are filled in with cement and gravel?

Ans. From one hundred to two or three hundred feet. In paving Clark street, I think, in one part they were laid six or eight hundred feet in advance.

Re-x-int. four. How far is it necessary to lay them in advance in such constructions?

132 A. That depends upon the rapidity of delivery of the gravel and tar for the joints; when this is delayed, as in the case alluded to on Clark street, it is sometimes necessary to lay the blocks a long distance in advance—otherwise from fifty to a hundred feet is the most convenient distance—in order that one branch of the construction may not interfere with others.

Re-x-int. 5. In constructing the Nicholson pavement, is it customary to throw the street open to general travel before the tar and gravel are filled in?

Ans. It is not.

Re-x-int. 6. What travel is necessary, then, to pass over the blocks of a pavement in the course of construction before the filling?

Ans. The passage of the teams bringing blocks, boards, and strips, and the passage of workmen passing to and fro carrying materials.

SAMUEL B. GREELEY.

Sworn and subscribed before me the 10th day of April, A. D. 1865,

D. GOODWIN, JR.,
Special Examiner.

[5 cent revenue stamp. D. Goodwin, April 10, 1865.]

Cir. Ct. U. S., N. D. Ills.

SAMUEL NICOLSON
vs.
THE CITY OF CHICAGO. } In chancery.

SIR: Please take notice, that on Monday morning next, April 10, 1865, at 10 o'clock a. m., we shall examine Samuel Greeley as a witness in this cause before Daniel Goodwin, jr., esq., a special examiner, appointed by the court in this cause, and a commissioner in the United States Court for the northern district of Illinois, at his office, No. 7, Smith & Nixon's block, in the city of Chicago.

Dated April 7, 1865.

Yours, &c.,
GOODWIN, LARNED & GOODWIN,
Sol'rs for Compt.

To FRANCIS ADAMS, Esq.,
City Att'y and Sol'r for Deft.

In the Circuit Court of the United States for the northern district of Illinois.

134 *Complainant's Exhibit C.—D. Goodwin, jr., special examiner.*

SAMUEL NICOLSON
vs.
THE CITY OF CHICAGO. } In chancery.

It is hereby stipulated and agreed by and between the solicitors for the respective parties in the above-entitled cause, that it shall be, and hereby is, admitted for all purposes in the said cause, with the same force and effect as if the same were proved formally in evidence; that the said defendant, the City of Chicago, heretofore, to wit, in the months of August, September, and October, A. D. 1864, caused it to be laid down in said city, on West Lake street, from the bridge on the south branch of the Chicago river, to the west line of Halstead street, a certain wooden pavement; said pavement contained fourteen thousand square yards, and was constructed as follows, to wit:

First. The street was brought to its proper circular grade, being at the centre one foot higher than at the gutters, by filling with earth, sand, or gravel, to within seven inches.

Second. The surface was made smooth, and to conform to the shape and circular crown and gutters of the street.

Third. Sleepers of one inch pine boards were imbedded on the surface across the street, at every length of the boards which
135 form the floor for the paving.

Fourth. Boards of the thickness of one inch were laid together in the street, close together, the ends of the boards resting on the transverse sleepers above described. These boards were tarred on both sides.

Fifth. Blocks six inches in length, sawed from three inch pine plank, were placed on end close together, and in rows on courses, tranversely across the street, on the above-described flooring. These rows or courses being separated by wooden pickets or strips one inch thick by three inches wide and four feet long, each picket or strip being nailed to the floor of the pavement by two nails; the pickets or strips were set on edge, so that the space between the blocks was the thickness of the pickets or strips. The spaces thus formed were three inches deep and one inch wide, and were filled with coarse gravel from the size of a pea to that of a hickory-nut.

Sixth. Tar obtained from the gas-works, made heavy by boiling, was then poured on the gravel, which was in the cells or chambers, after which the gravel in the cells was rammed down, and the whole surface was then sprinkled with tar, and then covered over with about one inch of coarse gravel.

136 Also, that the said defendant caused to be constructed and laid down on a certain engine house floor, situated on La Salle street, between Washington and Madison streets, in said city, a certain wooden pavement, containing three hundred and fifty-five square yards, in the month of Oct., 1864, and constructed as follows, to wit:

First. A flooring or foundation was made by laying down oak plank, two inches in thickness.

Second. The flooring was covered with two thickness of felt and composition.

Third. Blocks of wood two inches in thickness and four inches in length were set on end, close together, and in rows or courses; these rows were ½ an inch apart, and in the spaces between the rows strips of wood ½ inch in thickness and ½ inch in depth were placed, the strips resting on the flooring.

Fourth. The spaces between the rows of blocks and above the strips were then filled with gravel, and the whole surface was then covered with what is called a coal-tar composition, filling the gravel pockets formed as above described.

Also, that the said defendant caused a certain wooden pave-
137 ment to be constructed and laid down, in the month of June, 1864, in a certain engine-house floor, on the north side of West Lake street, between Clinton and Jefferson streets, in said city, containing two hundred and sixty-three square yards, and constructed like the engine-house floor first above described, with the exception that in the said last-mentioned engine-house the floor or foundation for the blocks was formed of one inch pine plank, imbedded in sand, and without the felt covering.

And it is further admitted, as aforesaid, that the said wooden pavement, so constructed and laid by the defendant upon West Lake street, in said city, was constructed, laid, and put down by David L. De Gollyer, as and for his execution of a written contract made by said defendant with said De Gollyer, a copy of which contract is hereunto annexed, marked No. 1, which contract was made in pursuance of an ordinance of said defendant, a copy of which is hereunto annexed, marked No. 2.

Dated April 8, 1865.

FRANCIS ADAMS, *Defendant's Solicitor.*
GOODWIN, LARNED & GOODWIN,
Sol'rs for Compl't.

138 *No.* 1.

Specifications for curbing, filling, and paving with Nicolson pavement West Lake street, from the west side of Halstead street to the planking of the railroad tunnel at West Water street, on E. S. and Bl'k, 29, O. T.

Specification for curbing, filling, and paving with Nicolson pavement, West Lake street, from E. S. of block 29, O. T., or the planking of the railroad tunnel to the west side of Halstead street.

Old Planking.—The plank and stringers which are in the aforesaid part of West Lake street will be taken up and removed by the contractor at his own expense, and for his own benefit and use, unless the board of public works shall determine to use the stringers for the city of Chicago, in which case the said planks and stringers will be taken up and removed by the said city of Chicago.

Curbing.—The curb-walls already built on both sides of said W. Lake street being below grade, will have to be built to grade.

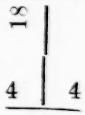
139 The return wall at the northeast corner of Canal and West Lake street will be built by the contractor, and connect closely with the wall already built in front of lot seven (7) in block 22, O. T., and be of the same dimensions as the same. All other walls to be built three feet and three inches (3 ft. 3 in.) wide at the bottom, eighteen (18) feet in height, except the wall to be built on the south side of West Lake street from Canal street east to the retaining wall across the street at the west end of the aforesaid railroad tunnel. These walls will be built of such dimensions as shown by sections appertaining to these specifications.

All walls (curb) shall be of first class rubble stone masonry, of Athens stone, or other stone equal in quality to the Athens stone, it being understood that what is called selected "Prairie Stone" may be used. All stone, however, to be of as good quality as that above stated, and that all stone used shall be of good size, and have, when laid, even top and bottom beds.

At all the street corners, at each street intersection, an arched recess must be cut in the curb wall, to permit the passage of water to the catch basin, similar to those on Lake street.

140 Mortar.—The mortar will be good lime mortar, made by thoroughly incorporating two parts of clean sand with one of best quick-lime, equal in quality to the best of Stearns & Co.'s. Every stone will be thoroughly imbedded in mortar. The top of the wall will be thirteen feet above low water, as per ordinance passed June 1st, 1863, hereinafter referred to.

Coping.—The curb walls will be coped with (3) three inch pine plank, fourteen (14) inches wide, where no stone side walks are to be laid on the wall, during the progress of the work upon which three by four (3×4) inch scantling shall rest, to recieve the planks. The coping and scantling will be anchored to the wall with one-half inch iron anchors every five (5) feet, and shaped thus



The upright of the anchor being eighteen (18″) inches and the base eight (8″) inches. The coping and scantling will be secured by screws, nuts, and washers, the nuts and washers to be counter-sunk, so as not to project above the top of the scantlings.

The necessary earth excavations for the curb walls will be done by the contractor at his own expense.

The property owners are allowed to build the curb walls in front of their lots, each man in front of his own property, the work to be done under the direction of the "board of public works," and "according to the foregoing specifications." Property

141 holders availing themselves of this permission to build curb walls, will be required to commence work on the same ten days in advance of the time that the contractor is prepared to build

the same, and to have the same finished complete ten days in advance of the filling, or else the walls will be built by the city, under the contract to which these specifications pertain.

All the curb-walls will be built according to the foregoing specifications as hereinabove provided for.

Filling.—The earth filling in said West Lake street shall be smoothly graded and shaped to conform to the shape of the pavement, so that the "ballasting gravel" on which the wooden pavement shall rest will be of a uniform thickness, and shall be well puddled, rammed, or rolled whenever the board of public works shall so direct, and shall be so firm and compact as to be secure from settling.

Approaches connecting said part of West Lake street with the streets intersecting the same, and such portion of West Lake street as lies west of the above-named improvement, will be filled so that the same shall have a slope not greater than one foot in twenty, unless the board of public works may otherwise direct, and upon
142 the approach on West Lake street (west of Halstead street) the macadam with which West Lake street is improved from Halstead street to the city limits, shall be taken up and well relaid upon the filling.

3. Pavement.—The pavement known as the Nicholson pavement shall consist of—

First. A bed of ballasting gravel six (6) inches in thickness, laid upon the top of the filling and smoothly rounded to the shape of the street, as per section on file in the office of the board of public works, in the book of street improvements, page 11.

Gravel.—The gravel shall be clean, uniform in character, containing no pebbles of a larger diameter than one inch.

Secondly. A flooring of sound common pine inch-boards, running in courses lengthwise of the street, thoroughly swabbed on both sides with hot boiled coal-tar, boiled down to the proper consistency to make a thorough coating, the ends resting upon stringers of the same material placed transversely; the whole evenly laid to such crown and grade as is shown on the aforesaid section, making a part of these specifications.

143 Third. Rows of sound three-inch Norway pine blocks, or white pine blocks, free from sap, loose or rotten knots, or other defects, six (6) inches long, placed end upon the flooring, the rows running across the street, and being kept an inch apart.

Said blocks will be sawed from three inch planks or joists. It is expressly understood that the board of public works reserves the rights to examine the lumber on the street before sawed into blocks; also the blocks, and to refuse any and all blocks and lumber brought in the street for the above purpose, especially if the appearance of the same shows if they have been cut of "dead logs;" that is to say, logs which have been exposed to the weather for such a length of time before having been sawed, as to take its vital strength from the same. Said blocks shall be set up as aforesaid, endwise, upon the flooring in rows running across the street, being separated by strips of boards or pickets, not more than one inch thick, nor more than (3) three inches wide, placed on edge between the rows.

Every strip or picket shall be nailed to the flooring and the bottom of the block by two (2) 10c. nails, to prevent their working up.

The blocks to be fitted so as to make close joints, and shall be uniformly laid, not varying in thickness more than a quarter of an
144 inch in the same row. All rot and defects to be trimmed off, and the rows both of blocks and strips to be laid closely together.

Gravel and tar.—The spaces or joints between the rows of blocks and above thestrips to be filled with clean roofing gravel and a composition of tar, rosin, &c., equal to that prepared by Messrs. Barret, Powel & Co., for such purposes, thoroughly mixed and compactly rammed down by means of a pavers rammer and an iron blade prepared to fit the joints, which is only to be moved three-fourths of its length at the time while ramming, to prevent any part of the aforesaid spaces from not being rammed. The gravel shall be composed of small pebbles of sizes from that of peas to that of walnuts, and free from fine particles which may prevent the tar from penetrating.

It shall be applied thoroughly, dried and heated enough not to chil the tar.

All the tar used shall be boiled down and thickened that when cool, it shall be tough and fibrous without liability to become brittle in cold weather, and shall be equal in quality to that used on the block pavement of the intersection of Clark & Madison streets. It shall be applied hot, and in such quantities as to fill and penetrate the joints.

145 Before any tar is applied to the above pavement, a sample of the same must be brought to the board of public works by the contractor for examination, under penalty of forfeiture of his contract. The whole surface shall be thoroughly sprinkled with hot coal-tar, and immediately covered with roofing gravel and common sand, or gravel mixed in about equal proportions, and not less than three quarters of an inch thick.

Grade.—The top of the wooden blocks in the corners of the curb-walls at the intersection of West Lake street with other streets to be twenty-six (26) inches below grade of sidewalks, as per ordinance in relation to the grade of sidewalks, as passed by the com. council June 1st, 1863, or eighteen inches below the top of the curb wall and crown; an arch from the gutter to the centre of said West Lake street, twelve inches; also the same way towards the centre of the streets intersecting said W. Lake street, thence the gutters shall rise towards the centre of the blocks at the rate of six inches in hundred feet to a summit, as usual, and as shown on the aforesaid drawings.

Cross-walks.—There shall be cross-walks at all street intersections or crossings, to be made by raising the wooden block paving in
146 the same manner as usual; said cross-walks will be made eleven (11) feet wide, corresponding with the paving of the street, and three (3) inches higher, and unless otherwise directed by the board of public works, there will be four (4) such cross-walks constructed at each street intersection, or twenty-four (24) in all.

All labor and material connecting the new pavement with the macadam of West Lake street, west of the west side of Halstead street, or with the openings for sewerage, gas, or water purposes, (such sewerage and water structures to be brought by the city to grade, and gas structures by the gas comp.,) and in general everything necessary to fully complete the work, so that with the completion of the paving, the street shall be in complete order, ready for use, shall be furnished and done by the contractor.

Anything herein omitted and shown on the aforesaid drawings, and vice versa, shall be done by the contractor without extra charge, or cost to the city of Chicago.

The liability of using the said Nicholson pavement, growing out of the claim that it is a patented invention, is assumed by the city.

This agreement made and concluded this tenth day of September, A. D. 1863, between David L. De Gollyer, of the city of Chicago, and State of Illinois, party of the first part, and the city of
147 Chicago, of the second part, witnesseth:

That the said party of the first part, for and in consideration of the payments to be to him made by the said city of Chicago, as hereinafter set forth, hereby covenants and agrees to curb, fill, and pave with Nicolson pavement, West Lake street, from the west side of Halstead street to the planking of the railroad tunnel on the east line of block twenty-nine, (29,) original town of Chicago, said work to be done in accordance with plans prepared for the doing of the same, on file in the office of the board of public works of said city, and with the specifications appended hereto, and made a part of this contract; said work to be finished and fully completed on or before the first day of December, A. D. 1863. But it is understood and agreed, that if at any time before that date the weather is deemed unsuitable by said board for the proper doing of the work, it shall then be suspended on their order to such effect, and in that case it shall be renewed next spring as early as the said board shall direct, and shall be finished and fully completed by the 1st day of June, A. D. 1864.

All the work shall be executed in the best and most workmanlike manner, and no improper material shall be used, but all ma-
148 terials of every kind shall fully answer the specifications, or if not particularly specified, shall be suitable for the place where used.

Should the board of public works deem it proper or necessary in the execution of the work to make any alterations which shall increase or diminish the expense, such alterations shall not vitiate or annul the contract or agreement hereby entered into, but the said board shall determine the value of the work so added or omitted, such value to be added to or deducted from the contract price, as the case may be.

The whole of the work shall be commenced and carried on when and where the board of public works shall direct, and it shall also be carried on regularly, so as to give the necessary time for each part to settle and harden. In case the board of public works shall think

that this is not sufficiently heeded, they may order more men to be employed on the work; and if they shall think the work proceeding too rapidly, they may order the employment of a less number of men.

Should the weather be unusually wet, or so cold and frosty that any part of the work cannot be done in a proper manner, or with due regard to durability, then the board of public works may order such part of the work to be suspended altogether until a more suita-
149 able season, in which case the party of the first part will cover and otherwise sufficiently protect the several parts of the works, so that they will not be injured by the weather.

This agreement shall not be assigned, nor any part of the work sub-contracted, without the written consent of said board endorsed hereon.

It is hereby provided and agreed, that if in any event the said party of the first part shall be unable to proceed with the work in accordance with the requirements and conditions of this agreement, that the said city, by its board of public works, shall have full right and authority to take the work out of the hands of the said party of the first part, and to employ other workmen to complete the unfinished work, and to deduct the expense thereof from any money that may be due and owing to the said party of the first part on account of the work. And the said party of the first part covenant and agree to perform all of said work under the immediate direction and superintendence of board of public works, of the city of Chicago, and to their entire satisfaction, approval, and acceptance. All materials used, and all labor performed, shall be subject to the inspection and the approval or rejection of said board, and the said city of Chicago hereby reserves to its board of public works the right finally to decide
150 all questions arising as to the proper performance of said work, and in case of improper construction to suspend said work at any time and relet the same, or to order the entire reconstruction of said work if improperly done, or to relet the same to some more capable and faithful contractor or contractors, and to adjust the difference of damage or price (if any there be) which the contractor or contractors failing to properly construct such work, in such case of default, should, in their opinion, pay to the city according to the just and reasonable interpretation of this contract.

And it is understood and agreed that no claim whatever will be made by the said party of the first part for extra work or material, or for a greater amount of money, than is herein stipulated to be paid, unless some changes in, or additions to, said work requiring additional outlay by said party of the first part, shall first have been ordered in writing, by the said board of public works.

The said city of Chicago hereby covenants and agrees, in consideration of the covenants and agreements in this contract specified, to be kept and performed by the said party of the first part, to pay to said party of the first part the sum of twenty-six thousand five hundred dollars, ($26,500,) for the filling and paving complete, and for all curb wall built west of Canal street, at the rate of twelve dollars, ($12 00;)

and east of Canal street at the rate of fourteen dollars ($14 00)
151 per cord of one hundred (100) cubic feet, when said work shall have been fully completed and accepted, and out of, and when the special assessment or assessments levied to defray the costs and expense of said improvement, shall be collected, agreeing hereby to make no claim against said city, except from the collections of the special assessments made for the work hereby contracted for, according to sec. 17, chap. VI, of the revised city charter; and said city will pay to said party of the first part such addition sums of money as said city may collect as "damages" on the assessment or assessments levied, or may be levied, for such improvement by virtue of the authority given in Sect. 11, Chap. IX, of the said city charter. It is also agreed that during the progress of said improvements, estimates in the usual form will be issued to said party of the first part by said board for eighty five (85) per cent. of the value of the work done, and that no estimate for the remaining fifteen (15) per cent. of the value of said improvement shall be issued until the final completion of said W. Lake street and its acceptance by said board.

In testimony whereof, the said party of the first part has hereto set his hand and seal, and the said city of Chicago has caused the
152 signature of the commissioners of its board of public works to be hereto affixed, the day and year first above written.

[L. S.] D. L. DEGOLYER.
[5 c. stamp.]
[SEAL.]

J. G. GRINDELE,
FRED. LETZ,
O. J. ROSE,
F. C. SHERMAN.
Commissioners of the Board of Public Works.

No. 2.—Report and Ordinance for improvements of streets.

To the Mayor and Aldermen, of the city of Chicago, in common council assembled:

The board of public works recommend the improvement of West Lake street with Nicolson pavement, from a point near the river to the west line of Halstead street, the street to be first curbed with a suitable wall and filled to grade.

The contemplated improvement is not asked for by the petition of the owners of a majority of the property to be assessed for such improvement, but the present improvement on said street can endure but a very short time, and the necessity of providing soon a suitable pavement is obvious.

153 We herewith submit an estimate of the expense thereof, accompanied by a general plan or description of the proposed work, together with a proper ordinance directing the work.

Estimate.

Curb-walls	$12,336 54
Filling	8,831 86
Grading	
Nicolson Pavement	$24,269 80
Costs of proceedings	
Total estimate of expense	$45,438 20
Less cost of intersections	7,141 31
Amount to be assessed	$38,294 89

Ordinance.

Be it ordained by the common council of the city of Chicago:

SECTION 1. That West Lake street, from the east line of block twenty-nine, (29,) original town of Chicago, to the west line of Halstead street be, and is hereby, ordered curbed, filled and paved with Nicolson pavement. Said work to be done under the superintendence of the board of public works conformably to the general
154 plan or description prepared by said board, and hereto annexed.

Section 2. That the sum of thirty-eight thousand two hundred and ninety-four 89-100 dollars be assessed by the commissioner of the board of public works upon the real estate by them deemed benefitted by the improvement hereby ordered, in proportion, as nearly as may be, to the benefits resulting thereto, according to the provisions of the revised charter, as amended, in such case made and provided, and that said sum, when collected, or so much thereof as may be necessary for that purpose, be applied to the payment of the expenses of the said improvement and the costs of said proceedings.

Respectfully submitted:

(Signed) J. G. GINDELE,
FRED. LETZ,
O. J. ROSE,
Board of Public Works of the City of Chicago.

CHICAGO, *May 18th*, 1863.

Passed June 1st, 1863.

H. W. ZIMMERMAN, *City Clerk.*

Approved June 3d, 1863.

F. C. SHERMAN, *Mayor.*

STATE OF ILLINOIS, *City of Chicago, ss:*

I, H. W. Zimmerman, clerk of the city of Chicago aforesaid, do hereby certify that the above and foregoing is a true
155 copy of an ordinance passed by the common council of said city on the first day of June, A. D. 1863.

I further certify that I am entrusted with the custody and safe keeping of the original, of which the above and foregoing is a true and certified copy.

Witness my hand and the corporate seal of the city of Chicago this sixth day of April, 1865.

[SEAL.] H. W. ZIMMERMAN, *City Clerk.*

[5-ct. stamp.]

156 The U. States Patent Office to all persons to whom these presents shall come, greeting:

This is to certify that the annexed is a true copy from the records of this office of the letters-patent granted Samuel Nicolson August 9, 1854, No. 11,491. Complainant's Exhibit A.

D. GOODWIN, JR.,
Special Examiner.

In testimony whereof, I, D. P. Holloway, Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed this fourth day of January, in the year of our Lord one thousand eight hundred and sixty-four, and of the independence of the United
157 States the eighty-eighth.

[SEAL.] D. P. HOLLOWAY.

The United States of America to all to whom these letters-patent shall come:

Whereas Samuel Nicolson, of Boston, Mass., has alleged that he has invented new and useful improved wooden pavements, which, he states have not been known or used before his application; has made oath that he is a citizen of the United States; that he does verily believe that he is the original and first inventor or discoverer of the said pavements, and that the same have not, to the best of his knowledge and belief, been previously known or used; has paid into the treasury of the United States the sum of thirty dollars, and presented a petition to the Commissioner of Patents, signifying a desire of obtaining an exclusive property in the said pavements, and praying that a patent may be granted for that purpose.

158 These are, therefore, to grant, according to law, to the said Samuel Nicolson, his heirs, administrators, or assigns, for the term of fourteen years from the eighth day of August, one thousand eight hundred and fifty-four, the full and exclusive right and liberty of making, constructing, using, and vending to others to be used, the said pavements, a description whereof is given, in the words of the said Nicolson, in the schedule hereunto annexed, and is made part of these presents.

In testimony whereof, I have caused these letters to be made patent, and the seal of the Patent Office has been hereunto affixed.

Given under my hand, at the city of Washington, this eighth day of August, in the year of our Lord one thousand eight hundred and

fifty-four, and of the independence of the United States of America the seventy-ninth.

159 [SEAL.] ROBERT McCLELLAND,
Secretary of the Interior.

Countersigned and sealed with the seal of the Patent Office.
C. MASON,
Commissioner of Patents.

1.—*The schedule referred to in these letters-patent and making part of the same.*

To all to whom these presents shall come:

Be it known that I, Samuel Nicolson, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful improvement in wooden pavements, and I do hereby declare that the same is fully described and represented in the following specification and the accompanying drawings, letters, figures, and references thereof.

Of the said drawings, Figure 1 represents a top view of my improved pavement. Figure 2 is a transverse and vertical section of it.

160 In carrying out my invention, I make use of two sets or series, a a a, b b b, of wooden blocks. They are cut from joist or timber four inches square, or of other suitable dimensions, in cross section, the longer blocks a a a being made about eight inches in length, while the shorter blocks, or those represented at b b b, are formed about half the length of the others. These blocks are placed end upwards, and are arranged both transversely and longitudinally, so that the long and short blocks shall be arranged alternately in each direction, or run as seen in the drawings. Such an arrangement of them leaves cells or cavities c c c, between the said blocks, each of the said cells being bounded by four of the long blocks and having its bottom formed by one of the shorter blocks. The upper surfaces of the long blocks, when thus placed together, present a checkered or tassellated appearance, and they will exhibit the open space or cells arranged together in a similar manner. Into

161 each of these cells a small quantity or layer of coarse salt may be put and the cells filled up with old broken stone or coarse gravel, the whole being firmly rammed, so that the upper surface of the mass in each cell shall be firm and level.

Next mineral or vegetable tar or pitch is to be poured over the whole surface of the pavement and into the cells or cavities containing the broken stone or gravel, so as to penetrate entirely between the pieces of stone or gravel and cement them together. The tar permeating into the squares containing the broken stone will cause the masses of the same to adhere firmly to the surrounding blocks, and will admit of expansion of the mass by the weight of the wheels of carriages in passing over them, such expansion serving to fill up such space as might otherwise be made by shrinkage of the wooden

blocks. In order to prevent the blocks from being forced be-
162 low one another they may be pinned together with wooden pins extending from block to block.

Instead of the broken stone and tar, and other suitable cementing materials, or cement, may be employed in the cells.

I prefer, however, common tar or pitch, and gravel or broken stone, as such in practice has been found to operate to great advantage and to be very durable in use, and to present a surface over which it is very difficult for a horse's foot to slip or slide as it will on the ordinary wooden pavement when its surface is wet or covered with mud.

The smaller blocks b b, serve to uphold the masses of cement and stone in the cells, and when such masses are compacted by any blows upon them, or the rolling of wheels over them, instead of being pressed down so as to slide down between the blocks, they are
163 made to spread laterally, and thereby completely close up the joints between the blocks and themselves, and so as to prevent water from passing down into the joints between the blocks. As the salt will slowly melt it will penetrate into the wood and aid in preserving it from decay.

The earth upon which the pavement is to rest may be prepared to receive the pavement by covering its surface with tarred paper or other preventive to moisture being absorbed from the ground by the wooden blocks.

My invention may be carried out in another form; that is to say, the long blocks may be arranged side by side and in rows transversely of the roadway, and with spaces about one inch in thickness between each two rows of them, in each of which spaces a strip of board may be introduced, the width of the board being equal to about half the length of the block.

164 These boards, being made to rest on the surface of the ground, create with the rows of the blocks long cells or grooves, extending transversely across the roadway, such cells or grooves being subsequently filled with broken stone or gravel and tar or cement. I do not, however, consider this method of carrying out my invention of so much value as the first, on account of the broken stone and tar or cement not being arranged between the blocks in longitudinal as well as transverse directions.

In order to prepare the earth of a roadway for the reception of my improved pavement, instead of employing tarred paper as above described, the upper surface of the roadway, after being suitably graded, may be covered with lime, mortar, or hydraulic cement, which may be laid over it about two inches in thickness, or it may have a superstruction of flooring of cheap boards laid over it,
165 the pavement being afterwards laid upon such boards. I would remark, however, that in view of the great durability of this pavement, (for the purpose of experiment, I have had some of it in use for six years on a road over which the travel has been very great,) such flooring would seem to be unnecessary.

* * * * * * * *

Some of the advantages of my improved pavement are to be found in the hold that it offers to the feet of horses, in the little noise that is produced by carriages in passing over it, the absence of noise resulting from the peculiar character of the materials of which the pavement is composed.

This pavement is also very durable, its durability being occasioned by reason of the friction of the travel over it being produced
166 upon the slightly elastic extremities of the fibres of the wooden blocks.

Moisture is excluded from the wood by the materials employed for the support of the blocks; also by the preventives; also by the tarry covering which is placed over the top surface, as hereinbefore described.

My pavement has the advantage of great cleanliness in comparison with most other pavements, because, in the first place, as there is very little wear of its upper surface, very little dust is likely to form upon it, and such as does form upon it is quickly removed by rains and wind.

What I claim as my invention is to so combine or arrange the blocks or wooden portion of the pavement that there may be cells or channels formed by such arrangement between them, as described, and for the reception of tar and gravel, or materials of such
167 character, and that each cell or channel shall have a wooden bottom for the tar and gravel cement to rest on, whereby, when the mass of tar and stone in each cell is pressed down by the wheels of carriages it shall be prevented from being forced through the cavity and be caused to be spread in lateral directions so as to maintain a firm and close joint between the adjacent blocks such as will operate to prevent water from passing down between their joints.

In testimony whereof, I have hereunto set my signature this twenty-ninth day of March, A. D. 1854.

SAMUEL NICHOLSON.

WITNESSES:

R. H. EDDY,
F. P. HALE, jr.

[Here follows drawing marked page 16.]

168 The U. States Patent Office to all persons to whom these presents shall come, greeting:

This is to certify, that the annexed is a true copy from the records of this office, of the letters patent reissued to Samuel Nicolson, Dec. 1, 1863. No. 1,583. Complainant's Exhibit B.

D. GOODWIN, Jr.,
Special Examiner.

In testimony whereof, I, D. P. Holloway, Commissioner of Patents have caused the seal of the Patent Office to be hereunto affixed, this fourth day of January, in the year of our Lord one thousand
169 eight hundred and sixty-four, and of the independence of the United States the eighty-eighth.

[SEAL.] D. P. HOLLOWAY.

No. 1583.

The United States of America to all to whom these letters patent shall come:

Whereas Samuel Nicholson, of Boston, Mass., has alleged that he has invented a new and useful improvement in wooden pavements, (for which letters patent were issued to him, dated August 8, 1854, which letters having been surrendered by him, the same have been cancelled and new letters ordered to issue to him on an amended specification,) which he states has not been known or used before his application, has made oath that he is a citizen of the United States; that he does verily believe that he is the original and first
170 inventor or discoverer of the said improvement, and that the same hath not, to the best of his knowledge and belief, been previously known or used: has paid into the treasury of the United States the sum of thirty dollars, and presented a petition to the Commissioner of Patents, signifying a desire of obtaining an exclusive property in the said improvement, and praying that a patent may be granted for that purpose:

These are, therefore, to grant, according to law, to the said Samuel Nicholson, his heirs, administrators, or assigns, for the term of fourteen years from the eighth day of August, one thousand eight hundred and fifty-four, the full and exclusive right and liberty of making, constructing, using, and vending to others to be used, the said improvement, a description whereof is given in the words of the said Samuel Nicholson, in the schedule hereunto annexed, and is made part of these presents.

171 In testimony whereof, I have caused these letters to be made patent, and the seal of the Patent Office has been hereunto affixed.

Given under my hand, at the city of Washington, this first day of December, in the year of our Lord one thousand eight hundred and sixty-three, and of the independence of the United States of America the eighty-eighth.

[L. S.] J. P. USHER,
Secretary of the Interior.

Countersigned and sealed with the seal of the Patent Office.

D. P. HOLLOWAY,
Commissioner of Patents.

1.

The schedule referred to in these letters patent and making part of the same.

172 To all whom it may concern:

Be it known that the following is a full, clear and exact description of the new and useful improved wooden pavement invented by me, Samuel Nicolson, of Boston, in the State of Massachusetts, and for which letters patent were granted to me on the eighth day of August, in the year of our Lord one thousand eight hundred and fifty-four, the said letters patent having been surrendered for the purpose of describing the same invention and pointing out in what it consists in more clear, full, and exact terms than was done in the original specifications.

The nature and object of my invention is the creation and constructing of such a wooden pavement for streets and roadways as shall be comparatively permanent and durable, by so uniting and combining all its parts, both superstructure and foundation, so as to

173 provide against the slipping of the horses' feet, against noise, against unequal wear, and against rot on and from the top surface, and against rot and consequent sinking away from below, or the working of the gravel or other material under the blocks so as to cause inequalities in the surface.

For a clear understanding of the manner of constructing my improved wooden pavement I refer to the accompanying drawings with corresponding letters of reference making part of these specifications, of which drawings No. I, figure 1, represents a top view of the first plan of said pavement, and figure 2, of the same drawing represents a transverse and vertical section of the same, and figure 1, of drawing No. II, represents a perspective view of the said pavement constructed after the second plan or modification; and figure 2, drawing No. II, a further perspective view of the said pavement on the first plan, and figure 3, drawing No. II, a further per-

174 spective view of the said pavement on the second plan.

The earth of a roadway upon which my improved wooden pavement is to be constructed, must first be suitably graded in any of the usual and well-known methods, in order to prepare it for the reception of such pavement.

When the street or roadway has been thus prepared for the reception of my pavement, I then cover the surface of the roadway or bed with tarred paper, or with lime, mortar, or hydraulic cement laid over it about two inches in thickness, or with a cheap flooring which may be also covered with tar, or any other preventive to moisture can be used for said foundation or support; the object and effect of such support or foundation, being to prevent moisture from being absorbed from the ground by the wooden blocks; said foundation or support is designated in said drawings by the letters *d d*.

175 In further carrying out my invention, I make use of two sets, or series, (*a a a b b b*,) of wooden blocks. They are cut with parallel sides, lines, or surfaces, from joist or timber about four

inches square, or of other suitable shape and dimensions in cross sections. The larger blocks *a a a* being made about eight inches in length, while the shorter blocks, or those represented at *b b b*, are formed about half the length of the others. These blocks are placed end upward upon said foundation or support, and are arranged both transversely and longitudinally, so that the long and the short blocks shall be arranged alternately in each direction, or run as seen in the drawings. Such an arrangement of them leaves cavities *c c c*, between the said blocks, each of the said cells being bounded by four of the larger blocks, and having its bottom formed by one of the shorter blocks.

* * * * * * *

176 The upper ends of the long blocks, when thus placed together, present a chequered or tesselated appearance and they will exhibit the open space arranged together in a similar manner. Into each of these cells a small quantity or layer of coarse salt may be put. These cells are filled up with small broken stone or coarse clean gravel, the whole being firmly rammed so that the upper surface of the mass in each cell shall be firm and level. Next mineral or vegetable tar or pitch is to be poured over the whole surface of the pavement and into the cells or cavities containing the broken stone or gravel, so as to penetrate entirely between the pieces of stone or gravel and cement them together. The tar permeating into the squares containing the broken stone or gravel will cause the masses of the same to adhere firmly to the surrounding blocks, and will admit of expansion of the mass by the

177 weight of the wheels of carriages in passing over them, such expansion serving to fill up the space which might otherwise be made by shrinkage of the wooden blocks. In order to prevent the blocks from being forced below one another in some of my modes of constructing the pavement they may be pinned together with wooden pins extending from block to block. Instead of the broken stone and tar any other suitable cementing material or cement may be employed in the cells. I prefer, however, common tar or pitch and gravel or broken stone, as such, in practice, has been found to operate to great advantage and to be very durable in use, and to present a surface over which it is very difficult for a horse's foot to slip or slide, as it will on ordinary wooden pavement when its surface is wet or covered with mud. The shorter blocks *b b b* serve to uphold the masses of cement and stone in the cells or cavities so

178 as to prevent particles of the broken stone or gravel from working under the longer blocks and thus upheaving them and causing inequalities in the pavement; and when such masses are compacted by any blow upon them, or the rolling of wheels over them, instead of being pressed down, so as to slide down between the blocks, they are made to spread laterally, and thereby completely close up the joints between the blocks and themselves, so as to prevent water from passing down into the joints between the blocks. As the salt will slowly melt it will penetrate into the wood, and aid in preserving it from decay.

My invention may be carried out in another form; that is to say, as seen in Fig. 1 and Fig. 3, Drawing No. II. The long blocks may be arranged side by side, and in rows transversely of the roadway, and with spaces about one inch in thickness between each two rows of them, in each of which spaces a strip of board may be introduced
179 edgewise or vertical, the width of the board being equal to about half the length of the block. These boards being made to rest on the foundation or support, resting on the surface of the ground, create with the rows of the blocks long cells or grooves extending transversely across the roadway, such cells or grooves being subsequently filled with broken stone or gravel and tar or cement. I would remark as to the great durability of my pavement that for the purpose of experiment I have had some of it in use for six years before the month of March, eighteen hundred and fifty-four, on a road over which the travel has been very great.

Some of the advantages of my improved pavement are to be found in the hold that it offers to the feet of horses, in the little noise that is produced by carriages in passing over it, the absence of noise resulting from the peculiar character of the materials of which
180 the pavement is composed. This pavement is also very durable; its durability being occasioned by reason of the friction of the travel over it being produced upon the slightly elastic extremities of the fibres of the wooden blocks.

Moisture is excluded from the wood by the materials employed for the support of the blocks; also by the preventives; also by the tarry covering which is placed over the top surface, as hereinbefore described.

My pavement has the advantage of great cleanliness in comparison with most other pavements, because, in the first place, as there is very little wear of its upper surface, very little dust is likely to form upon it, and such as does form is quickly removed therefrom by rains and winds.

Having thus fully described the parts and combination of parts and the operation of my improved wooden pavement, and shown
181 various modes in which the same may be constructed and made to operate without changing the principle of its construction and operation, what I claim therein as my invention, and desire to secure by letters patent, is—

The so combining or arranging the foundation or support (or its equivalent) of said wooden pavement resting on the roadway surface or bed, substantially as herein described, with said long and short blocks above described, (or their equivalents,) which said blocks are combined in such manner as that partitions shall be made, leaving cells or channels between them with a wooden bottom formed by the shorter blocks some distance above the lower end of the longer blocks for the reception of the broken stone or gravel, and tar or other like material; and also combined with such cells or channels filled with broken stone, gravel, and tar, or other like material, substantially as herein described, having such wooden bottom to rest upon,
182 substantially as herein described, whereby the particles of pounded stone or gravel are prevented from working under

the lower ends of the longer blocks, and whereby water is prevented from passing from the surface of the pavement downwards through the joints of said wooden blocks, and also moisture is prevented from being absorbed upwards from the ground by said wooden blocks, substantially as herein described.

SAMUEL NICOLSON.

Witnesses:
STEPHEN A. GOODWIN.
DANIEL GOODWIN, JR.

[Here follow drawings, marked page 182, No. 1, and page 182, No. 2.]

183 Circuit court of the United States for the northern district of Illinois

SAMUEL NICOLSON. *vs.* THE CITY OF CHICAGO.

UNITED STATES OF AMERICA, *District of Massachusetts:*

Be it remembered, that on the twenty-eighth day of August, in the year of our Lord eighteen hundred and sixty-five, at Boston, in said district of Massachusetts, before me, C. W. Tuttle, a commissioner in and for the district of Massachusetts, to take affidavits and bail in civil causes depending in the courts of the United States, appointed by the Circuit Court of the United States for the first circuit, under the acts of Congress in such case made and provided, personally appeared Samuel Nicolson, a witness for the complainant in a
184 certain civil suit depending in the Circuit Court of the United States in and for the eighth circuit and northern district of Illinois, wherein Samuel Nicolson is plaintiff and the City of Chicago is defendant, and the said Samuel Nicolson, being by me first carefully examined and cautioned and sworn to testify the whole truth relative to the issue, did depose and say, in answer to interrogatories proposed by Stephen A. Goodwin, esq., for the complainant, as follows, viz:

S. N.

Int. 1. State your age, residence, and occupation.

Ans. My age is seventy-three years; residence, Boston, Massachusetts; I have now no special occupation.

Int. 2. Are you the patentee named in letters patent, marked Exhibit A, for complainant, in this case, issued August 8, 1854?

Ans. I am.

Int. 3. Complainant's counsel here puts in evidence certified copy of original application and caveat, dated August 2, 1847, and file wrapper, showing receipt of same in Patent Office, Aug. 4, 1847, and final application made April 12, 1854, and it is hereto annexed and marked complainant's Exhibit D.

[SEAL.]

C. W. TUTTLE,
U. S. Commissioner.

185 Int. 4. Are you the Samuel Nicholson named in said Exhibit D?

Ans. I am.

Int. 5. State how long before said last-mentioned application you had turned your attention to the invention of a wooden pavement, and the circumstances that induced you to do so?

Ans. For many months previously I had given the subject of pavements, in general, great investigation. I was the superintendent of the Boston and Roxbury Mill Corporation, which corporation had about nine miles or more of roadway under my special care. My object was to improve those roads in the best manner for accomodation of public travel.

Int. 6. At the time you made the said last-mentioned application, Exhibit D, had your said invention been tried or laid down upon any street in any form?

Ans. No; not to my knowledge.

Int. 7. Look upon the pamphlet copy of defendant's Exhibit A, herewith shown to you, and hereto annexed, and state how long after the filing of your said application and caveat, the one hundred feet of wooden pavement in defendant's Exhibit A, mentioned as

186 laid on the Western Avenue—

Ans. That experiment—the first experiment—was completed and opened for public travel on the 19 day of July, 1848. I made no experiments of the invention previous to the experiment last named.

Int. 8. State your reasons for laying down the different forms of pavement, so stated by you in said pamphlet, and especially the round tree-cut blocks, not referred to in your said application and caveat.

Ans. To test the value of my invention. My reason for putting down round tree-cut blocks was to fill out the gutters on each side of the traveled road, and because my blocks to represent my invention were so few that they would not extend a great distance on the road. The materials from which I made the tree blocks were at hand, and could be economically applied to the gutters of the road where there was but little or no travel. I did not consider the round tree-cut blocks, as laid, as a part of my invention.

Int. 9. State whether, in either of the four modes of laying [illegible] one hundred feet of road on said Western Avenue, completed July 19, 1848, a plank flooring was actually used; and if not, state

187 how the said diagrams, Nos. 1, 2, and 3, in said pamphlet contained, def. Exhibit A, happen to show said plank flooring, and your reasons for inserting diagram No. 3, in said pamphlet.

Ans. A plank flooring was not used in my first experiment. The pamphlet was published after several experiments, according to my invention, had been made on several public streets in Boston, and in which several experiments I used the board or plank flooring, except on a portion of Exchange street and on South Boston bridge. My first experiment, after that named on the 19th July, 1848, was on South Boston bridge, where the planking of the bridge supplied the

185 Int. 4. Are you the Samuel Nicholson named in said Exhibit D?

Ans. I am.

Int. 5. State how long before said last-mentioned application you had turned your attention to the invention of a wooden pavement, and the circumstances that induced you to do so?

Ans. For many months previously I had given the subject of pavements, in general, great investigation. I was the superintendent of the Boston and Roxbury Mill Corporation, which corporation had about nine miles or more of roadway under my special care. My object was to improve these roads in the best manner for accommodation of public travel.

Int. 6. At the time you made the said last-mentioned application, Exhibit D, had your said invention been tried or laid down upon any street in any form?

Ans. No; not to my knowledge.

Int. 7. Look upon the pamphlet copy of defendant's Exhibit A, herewith shown to you, and hereto annexed, and state how long after the filing of your said application and caveat, the one hundred feet of wooden pavement in defendant's Exhibit A, mentioned as

186 laid on the Western Avenue—

Ans. That experiment—the first experiment—was completed and opened for public travel on the 19 day of July, 1848. I made no experiments of the invention previous to the experiment last named.

Int. 8. State your reasons for laying down the different forms of pavement, so stated by you in said pamphlet, and especially the round tree-cut blocks, not referred to in your said application and caveat.

Ans. To test the value of my invention. My reason for putting down round tree-cut blocks was to fill out the gutters on each side of the traveled road, and because my blocks to represent my invention were so few that they would not extend a great distance on the road. The materials from which I made the tree blocks were at hand, and could be economically applied to the gutters of the road where there was but little or no travel. I did not consider the round tree-cut blocks, as laid, as a part of my invention.

Int. 9. State whether, in either of the four modes of laying [illegible] one hundred feet of road on said Western Avenue, completed July 19, 1848, a plank flooring was actually used; and if not, state

187 how the said diagrams, Nos. 1, 2, and 3, in said pamphlet contained, def. Exhibit A, happen to show said plank flooring, and your reasons for inserting diagram No. 3, in said pamphlet.

Ans. A plank flooring was not used in my first experiment. The pamphlet was published after several experiments, according to my invention, had been made on several public streets in Boston, and in which several experiments I used the board or plank flooring, except on a portion of Exchange street and on South Boston bridge. My first experiment, after that named on the 19th July, 1848, was on South Boston bridge, where the planking of the bridge supplied the

flooring. When I subsequently got up said pamphlet, I designed to exhibit my pavement in the mode in which I latterly practised, and not meaning that the flooring was actually used in that experiment; but I considered the concrete foundation as described in said pamphlet, with the blocks pinned or tree nailed together, and the plank flooring, as subsequently used in Mason street, and elsewhere, and as mentioned in my subsequent patent as equivalents. My reason for inserting diagram No. 3 in said pamphlet was to show to the
188 public all I had done in relation to pavements, and to exhibit more effectually the invention patented in contrast with it.

Int. 10. State which of the said modes of wooden pavement, as shown in said pamphlet, proved the most satisfactory.

Ans. The second method, illustrated by diagram No. 2. I found that the blocks placed transversely of the street, in rows, better suited to the public travel, and more quickly constructed. The invention illustrated in diagram No. 1 gave great satisfaction, but did not please me so well as No. 2, for ordinary purposes. The same remark applies to the fourth method. The method shown in diagram No. 3 did not prove satisfactory; the blocks wore very unevenly, and became in consequence full of holes, like a badly worn rubble pavement. I may here state that I tried it fully on Exchange street subsequently on a hundred or more feet of the travelled road. I never tried it afterwards.

Int. 11. State what was your object and design in said trial and laying down of your invented pavement on said Western avenue, as before mentioned, and whether or not you received any compensation or patent fee, directly or indirectly, for the use of said
189 invention on said Western avenue, and the person or corporation for whom the same was laid, and all the circumstances thereof.

Ans. To exhibit a better mode of pavement than any previously known, and to test the value of my invention. I never received compensation or patent fee for that pavement or experiment on said avenue, either directly or indirectly. I never received any compensation or patent fee from any source until after I had received my patent. The pavement on the Western avenue was laid as an experiment by me, as agent of the Boston & Roxbury Mill Corporation, and without consultation with them. I had full powers to manage the concerns of the corporation, according to my best judgment, and I wished to test the usefulness of this invention.

Int. 12. State the reasons why your final application for a patent was deferred to the twelfth of April, 1854.

Ans. In order that I might more effectually and thoroughly test its durability. During the term, from the time of laying the hundred feet, on the 19th of July, 1848, on Western avenue, up to the time of my final application, it was my habit to visit this pavement
190 on Western avenue daily, and there to witness the comments of public travellers over said pavement, during which I did inform myself of general impressions regarding it. After a lapse of about five years some of the blocks were removed—taken up—for

examination, and found to be in good condition, and sound. I did not feel justified in a final application for a patent till I was satisfied of its durability and value for public purposes by these examinations and the lapse of time.

Int. 13. Was there a further edition of your said pamphlet published in Feb., 1864, and will you annex a printed copy thereof to your deposition, and make it a part of your evidence herein?

Ans. There was such a further edition published. I here produce and annex to my deposition as a part thereof a printed copy of said last-mentioned edition of said pamphlet, and it is marked by the commissioner complainant's Exhibit E.—W. T., U. S. Com.

Int. 14. Did you have possession of the original of the appendix to said 1864 edition of said pamphlet? If so, state what has be-
191 come of said originals, and if destroyed, does the said appendix contain true copies of said originals as signed by the parties respectively?

Ans. I did have possession of the originals, and gave them into the hands of the printer, and they are not now to be found, and I have reason to believe they have all been destroyed. I compared the appendix of the originals of the appendix with the printed copies thereof and found them correct and true copies.

Int. 15. Have you examined the patents and specifications purporting to have been issued and enrolled in England to David Stead, Thomas Wood the younger, John Perring, Osborne Reynolds, Richard Gurrey, Joseph Crannis, and Robert Kent, Richard Love, jr., Henry Austin, and William Grimman, and the patent specification to Sir John Scott Lillie, referred to in defendant's answer, and contained in defendant's exhibits stipulated in evidence in this cause? If so, please state when you first saw the said printed patents and specifications respectively, or either of them, and where you first heard of them, or of any similar wooden pavement as patented in England, or described in any English publication.

Ans. I have examined them. I never saw those specifica-
192 tions, or either of them, till my attention was called to them by my counsel in this case after the commencement of a suit by me against the city of Chicago, and within the last two years; and I never heard of them, or either of them till then, nor of any similar wooden pavement as patented in England or described in any English publication.

Int. 16. At the time of your first application and caveat in this case, or at the time of your final application for the patent in Aug., 1854, what information had you, if any, of any attempted wooden pavements either in England or the United States? and, if any, what was the construction and plan of such wooden pavement known to you?

Ans. The only information I had concerning wooden pavements were of those laid down in the cities of Boston and New York many years before either of those times, and they were exploded by reason of want of durability and safety. One form of the blocks in the Boston was narrow and long, and about six or eight inches deep, the

fibres of the wood were vertical; they were laid close together upon a graded earth surface; also another form of six sided blocks placed close together upon a graded earth surface and a third form of six sided blocks with a groove about two inches wide and a half inch deep
193 around three sides of the said block, and in the centre of the block and on the three other sides of the same block a tongue two inches wide and a half inch deep; these block were made to stand close together, with the tongue of one inserted into the groove of the other, the operation of this being to dowel or pin the said blocks together as they stood close together on the roadway; those blocks were also laid upon a graded earth's surface. There was another form of common square blocks, about eight inches long and about six or eight inches square; these were placed close together on a graded earth surface. There were no interstices between any of the above blocks nor cells between them, and I never saw or heard of a wood pavement with such interstices or cells between the blocks until I myself invented and used the same. Sometime—many years—before those dates I saw wooden pavement on the streets in New York. The shape of the blocks I cannot describe; but this I know, there were no interstices or cells between the blocks. These are all the kinds of wooden pavement I ever knew of until I invented my own.

Int. 17. Do you know David L. De Goleyer, of the city of Chicago? If yea, state whether the said De Golleyer, in a conversation with you, held in the city of Chicago in or about the fall of 1863, or the
194 summer of 1864, stated that he had caused a small piece of pavement to be constructed in Chicago after the plan described in Henry Austin's patent, on Clark or Rudolph street, and that he found the same troublesome and more expensive in construction than the Nicolson, and that he had abandoned the experiment.

Ans. I do know the said David L. De Golleyer; I clearly recollect the conversation referred to in the question, and that is substantially the conversation. I then replied to him if he would continue to pave after the Austin I should make no complaint if he would not make use of my invention.

SAMUEL NICOLSON.

UNITED STATES OF AMERICA, *District of Massachusetts:*

I, C. W. Tuttle, a commissioner in and for the district of Massachusetts, appointed by the Circuit Court of the United States for the first circuit, under the act of Congress authorizing the appointment of commissioners "for the more convenient taking of affidavits and bail to be used in civil causes depending in the courts of the United States, and the acts additional thereto, do hereby certify that
195 the reason for taking the foregoing deposition is, and the fact is, that the said Samuel Nicolson is a material and necessary witness in the cause in the caption of the said deposition named, and lives at Boston in said district, a greater distance than one hundred miles, and the place of taking the deposition is more than one hundred miles from the place of trial of the cause for and in which said deposition is taken.

I further certify that it was proved before me by this affidavit of the plaintiff that the defendant and its attorney are domiciled at Chicago, more than one thousand miles from Boston the place of taking said deposition, and for this reason, no notification of the time and place of taking said deposition served by me on the defendant or its attorney, but the complainant produced and filed due notice upon the defendants attorney, and proof of the same is herewith filed and returned.

And I further certify that the said witness was of sound mind and lawful age, and the said witness having been by me first carefully examined and cautioned and sworn to testify the whole truth in the cause aforesaid, did answer to the interrogatories and cross-interrogatories put to him, and the testimony given by him was by me reduced to writing in the presence of the witness, and that he
196 subscribed the same as and for his deposition in my presence, and that I have retained the said deposition in my possession for the purpose of forwarding it under my own hand to the court for which it is taken with this certificate of the reason of its being taken.

I further certify that I am not of counsel or attorney to either of the parties in the ceuse in and for which the said deposition is taken nor in any way interested in the event of said cause.

In testimony whereof I have hereunto set my hand and seal this twenty-eighth day of August, in the year of our Lord eighteen hundred and sixty-five.

[SEAL.] C. W. TUTTLE,
Commissioner of Circuit Court of U. S. Mass. Dist.

{ Stamp 5 cts, cancelled. C. W. T., Aug. 29, 163. }

197 U. S. Cir. Ct., N. D. Ill.—In Chancery.

SAMUEL NICOLSON
vs.
THE CITY OF CHICAGO.

SIR: We shall examine witnesses "de bene esse" in this cause on the 28th day of August, 1865, in behalf of the complainant, before Charles W. Tuttle, United States commissioner, at his office No. 47 Court street, in the city of Boston, such examination to commence at ten o'clock a. m., and at which you are at liberty to be present and cross-examine if you see fit.

Dated July 12, 1865.

Yours, &c.,
GOODWIN, LARNED & GOODWIN,
Sol'rs for Comp't.

To FRANCIS ADAMS, Esq., *Deft's Sol'r.*

Served July 12, 1865, in office. Service admitted July , 1865.
S. A. G.

198 UNITED STATES OF AMERICA, *District of Massachusetts, ss:*

Stephen A. Goodwin, of Chicago, being sworn, says that he served the within notice in the within entitled cause upon Francis Adams, esq., deft's att'y, on the 12th day of July, 1865, by leaving a copy of the same in his office with his partner or associate during business hours, and deponent knows from conversation with Mr. Adams within a week afterwards that said notice come to his notice and attention at the time.

S. A. GOODWIN.

{ 5 cent stamp cancelled. C. W. T., 28 Aug., 1865. }

Subscribed and sworn this 28th day of August, 1865, before me.

C. W. TUTTLE,
U. S. Commissioner, Mass. District.

199 United States Circuit Court, northern district of Illinois.—In chancery.

SAMUEL NICOLSON,
vs.
THE CITY OF CHICAGO.

DISTRICT OF MASSACHUSETTS, *ss:*

Samuel Nicolson, of Boston, in the district of Massachusetts, being sworn, says that he is the plaintiff in the above-entitled cause; that he is advised by his counsel, and verily believes, that the testimony of himself is material and necessary for the complainant in the prosecution of the above-entitled cause; that the deponent lives at said Boston, in said district, more than one hundred miles from Chicago, in the northern district of Illinois, the place of trial. And this deponent further says, that he is informed, and believes, that the defendant is a municipal corporation domicilled at said Chicago, about one thousand miles distant from said Boston, the place where the examination of said deponent is to be taken; and that,
200 as he is informed and believes, Francis Adams, esq., the attorney and solicitor of defendant in this cause, resides at said Chicago, about one thousand miles from Boston, aforesaid; and deponent further says he is informed by his solicitor in this cause, and believes, that due notice of the examination of witnesses for this day before C. W. Tuttle, esq., United States commissioner, had served on defendants' solicitor on the twelfth day of July, 1865.

SAMUEL NICOLSON.

Subscribed and sworn to this twenty-eighth day of August, A. D. 1865, before me.

C. W. TUTTLE,
U. S. Commissioner, Mass. District.

{ 5-cent stamp; cancelled. C. W. T., Aug. 28, 1865. }

201 The U. States Patent Office to all persons whom these presents shall come, greeting:

This is to certify that the annexed is a true copy from the files of this office of the file wrapper and contents of the caveat filed by Sam'l Nicholson, August. 4, 1847.

In testimony whereof, I, D. P. Holloway, Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed this fifteenth day of August, in the year of our Lord one thousand eight hundred and sixty-five, and of the independence of the United States the ninetieth.

[SEAL.] D. P. HOLLOWAY.

202 To the Commissioner of Patents of the United States of America:

The petition of Samuel Nicolson, of Boston, in the county of Suffolk, and State of Massachusetts, respectfully represents that he has discovered or invented certain new and useful improvements in street or road pavement, and that he is now engaged in making experiments for the purpose of perfecting the same preparatory to depositing in the Patent Office of the United States a correct specification thereof in order to obtain letters patent therefor; he therefore desires to obtain an exclusive property in his said invention or discovery, and prays that this instrument may be considered as the preliminary application or petition required by law to be made in order to obtain letters patent, and that his right in the said invention or discovery may be protected until he shall have matured the same; and that the subjoined or accompanying description which sets forth the design and purpose of the said
203 invention or discovery and its principal and distinguishing characteristics may be filed as a caveat in the confidential archives of the Patent Office, agreeably to the act of Congress in in that case made and provided, and that due notice may be given him through his attorney, R. H. Eddy, of Boston, in the State of Massachusetts, of any interfering application or applications which may be made within one year from the time of such filing of this caveat, and he having paid twenty dollars into the treasury of the United States, and otherwise complied with the requirements of the said act.

Signed at Boston, in the State of Massachusetts, this second day of August, A. D. 1847.

SAMUEL NICOLSON.

204 The following is the description hereinabove referred to:

My invention or improvement in street pavement may be described as follows, viz: Wooden blocks are cut from joints of about four inches square, and half of which are cut eight inches long, the other half are cut four inches long; they are placed side by side on the prepared earth, the ends being upward and in alternate position of long and short blocks, so that no two blocks

of the same length will stand together, but so as to present a checkered surface, the lower ends being on a level; the upper will present alternate open squares of about four inches by four inches deep, into said openings a small quantity of coarse salt is first put, then small broken stone is firmly rammed so that the whole surface of the pavement is firm and level, then tar is poured over the whole surface, after which a sprinkling of sand or gravel. The tar penetrating into the squares containing the broken stone will give the same adhesion and admit of its expanding by the weight of
205 wheels which may pass over it, thereby filling such space as might otherwise be made shrinkage of the wooden blocks.

In order to prevent a block from being forced below a level they are pinned together in sets of three or four, say two long blocks, with a short block between them, the pin should be about one inch in diameter, passing entirely through them.

Instead of broken stone and tar used in the spaces above named, any other material or cement may answer as well, the design being to use something which will expand as the wood contracts, by which a hard surface preventing water from penetrating to rot the wood.

As the salt will slowly melt it will penetrate the wood along the pin which fastens them and aid in preserving the wood from decay.

The earth may be prepared to receive the pavement by covering the surface with paper saturated with tar or other preventive to moisture rising to rot the under surface of the blocks.

SAMUEL NICOLSON.

[Here follows drawing, marked page 2, 205.]

207 App'd Ap'l 12, 1854. Caveat. Samuel Nicholson, of city Boston, county of Suffolk, State of Mass. Imp't in street pavements. Rec'd Aug. 4, 1847. Petition do. Affidavit do. Specification do. Drawing. Model. 1 ass't treas. Boston Crt., $20, Aug. 4, '47, 2 3 cash. Examined. Issue. Patented 184—. Recorded vol. —, page ——. R. H. Eddy. Ex'd A. T. P.
208 complainant's Exhibit D. C. W. Tuttle, U. S. Commissioner.

Endorsed: Opened Sept. 23, 1865, as per stipulation filed. Wm. H. Bradley, cl'k.

209 UNITED STATES, *Northern District of Illinois, ss:*

Be it remembered, that on the twenty-third day of October, A. D. 1865, personally appeared Lester L. Bond, Thomas D. Stetson, Reuben Cleveland, Samuel S. Greely, and Edward S. Remvick, before me, Phllip A. Hoyne, a commissioner appointed by the Circuit Court of the United States in and for the northern district of Illinois, in the eighth circuit, under the laws of the United States, to take affidavits and acknowledgements of bail, &c., to testify, and in truth to say on the part and behalf of the complainant in a certain suit or matter o controversy now depending and undetermined in the Circuit Court of

the United States for the northern district of Illinois, wherein Samuel Nicholson is the complainant, and the City of Chicago is defendant; and the said witness, Lester L. Bond being of lawful age, and having been by me first cautioned and to testify the truth, the whole truth, and nothing but the truth in the matter of controversy aforesaid, did thereupon depose, testify, and say, as follows, viz:

210 Examination-in-chief in behalf of the complainant, began on Monday, October the twenty-third, A. D. 1865, at 10 o'clock a. m.

P. A. HOYNE,
U. S. Comm'r.

Lester L. Bond called, and having been by me first duly cautioned and sworn to testify the truth, the whole truth, and nothing but the truth in the cause aforesaid, thereupon testifies, as follows:

Interrogatory first. What is your name, age, and occupation, and where do you now reside?

Ans. My name is Lester L. Bond; my age is thirty-five years and upwards; a lawyer and patent solicitor by profession; resident of Chicago.

Int. 2. Are you a member of the board of aldermen and a member of the finance committee of the city of Chicago?

Ans. I am.

Int. 3. State what have been your opportunities and experience in the study and understanding of labor-saving machines and various mechanical devices, and also what has been your experience in the investigation and examination of patents?

211 Ans. From 1845 to 1853 I worked summers in my father's shop as an operative mechanic; in 1858 I commenced the business of soliciting patents; since that time I have taken ont a number of patents, examined a great many machines and devices, and have been frequently called as expert in litigated patent cases.

4th. Have you, in the course of your experience, up to this time, had occasion, among other things, to examine and pay attention to the subject of street pavements in Chicago or elsewhere?

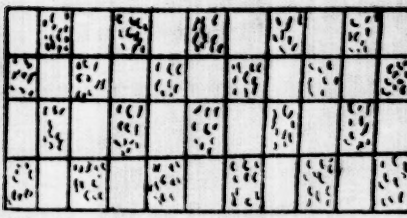
Ans. I have; the first two years I was in the city council, (I am now in my third year,) I was a member of the committee for streets and alleys for the west division, when the subject of street pavements was very frequently discussed as to what pavements were best for this city. I have frequently observed pavements in other cities, but not with respect to wooden pavements in those cities. I have examined wooden pavement in this city, as that has been for the last 2 or three years the leading pavement.

5th. Have you examined, and are you familiar with, the reissued patent and specifications of Samuel Nicolson, the complainant in this cause, of date December 1, 1863, and numbered 1,583, as set forth with the drawings annexed, complainant's Exhibit "B," in this

212 cause.

Ans. I have examined said exhibit, and am familiar with its contents.

Section showing the Block

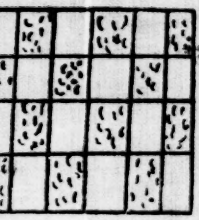


Plan of Pavemen

183 { The City of Chicago
vs.
Sam[l] Nicholson }

Pin

Blocks, cement, and Pin



ment

This pavement will also prevent Horses from slipping the hoof grasping on each square

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6th. Have you examined, and are you familiar with, the English specifications of Henry Austin, as set forth in the defendants' exhibit marked "G," in this cause.

Ans. I have examined it, and am familiar with the same.

7th. State whether or not you find the invention and combination of Nicholson, as set forth and claimed in his said reissued letters patent and specifications described and set forth in the said specifications of Henry Austin's, and whether or not the pavement so described by Henry Austin in his said specifications is identical with or different in principle from the pavement described and claimed in the said reissued patent and specifications of Samuel Nicholson; and if you shall find the same identical or different in principle, state your reasons for the opinion you shall express.

(Objection by defendant to the first clause of interrogatory down to Henry Austin, as calling for contents of a written instrument.)

Ans. I do not find the combination of Nicholson set forth or shown in Austin's specification. I consider the pavement described by Austin different in principle from that described by Nicholson. In order that I may be understood, I will first state what I consider

213 Nicholson's combination as claimed to be. Mr. Nicholson claims a combination consisting first, of a foundation which fulfills two important objects, the first supporting the blocks evenly; secondly, a prevention from the absorbtion of moisture by the blocks from below. This foundation fulfilling these objects is then combined with a superstructure of long and short blocks, the long blocks being about 8 inches in length, and resting upon the end of the fibre of the wood; the short blocks are about half the length of the long blocks, and so arranged with such long blocks as to form cells in the first method and channels in the second; said short blocks, which, in the second method, may be strips of board forming a wooden bottom to the cells or channels, in order to prevent gravel from getting below the long blocks and displacing them, and also to form a tight cell or channel when properly constructed, so as in a measure to prevent water from passing below to the bottom of the superstructure; these channels or cells so formed of long and short blocks or strips of wood are further combined with a filling of broken stone or gravel and tar, or other suitable cement, to be filled to the top in such a manner that the weight of the carriages passing over this filling will cause it to expand, so as to fill any interstices which may be caused by shrinkage of the blocks, and prevent water from passing below. The filling is also to be thoroughly rammed, and when the pavement is completed a coating of tar is placed over the whole surface of the pavement.

214 The pavement described by Austin differs in principle in the foundation from the Nicholson pavement in lacking entirely any provision for the prevention of moisture penetrating the blocks from below; and in the superstructure the cells or channels in the Austin go down the entire length of the blocks to the foundation, thus making the side support of his blocks depend entirely upon the filling, whereas, in the Nicholson superstructure, about one-half of the distance up from the foundation it is a solid wood pavement, and in

this condition teams can be driven over the Nicolson pavement with comparative safety to the superstructure without any filling for a considerable length of time, which, in my judgment, cannot be done on the Austin superstructure before it is filled, the lower half of the Nicholson pavement being a solid wood pavement, so far as it can be made of separate blocks or pieces, and the entire lack of this feature in the Austin makes, in my judgment, a broad and substantial difference in principle. There are also other differences between the two pavements, where flooring of wood is used in the Nicholson; it is covered with tar, and the boards are used in the lengths, in which they are originally manufactured, and supported below simply by the prepared roadway. The Austin foundation, when of wood, is made in compartments, which are fitted into each other and supported by ledges projecting from underneath the wood foundation, or
215 laid on stringers, previously laid in the prepared roadway longitudinally, which ledges or stringers are entirely wanting in the Nicholson in the construction of the pavement. The Nicholson foundation is first laid on the road bed; the superstructure is then wholly completed on such foundation as previously laid. In the Austin the foundation is prepared in compartments in the shop, or in some suitable shed by the roadway, and the blocks glued, cemented, or otherwise attached to such compartments before they are laid in the roadway. In the Nicholson superstructure the filling is compacted by ramming, which can be done with safety, as the long blocks have a strong side support furnished by the short blocks. In my judgment, such ramming or compacting of the filling cannot be done in the Austin pavement, owing to its total lack of side support to the long blocks, other than the filling itself. The filling or concrete, so far as broken stone and gravel concreted with adhesive liquid material are concerned, may, I think, within the specification, be made alike; but there is no suggestion in Austin of any preventive of moisture passing from the top to the bottom of the blocks, although I am aware that Austin mentions a cement or glue for his veneers, which shall be sufficiently strong and not so affected by moisture or such a degree of heat as to injure the joints, which I do not considers refers
216 to his paving. Nicholson directs in his specification that the channels, filled with broken stone or coarse clean gravel, shall then be filled with mineral or vegetable tar or pitch, so as to penetrate entirely the broken stone or gravel in his cells or chanels, and cement them together. Austin specifies that the channels in his pavement may be filled with sand, which filling would prevent tar or pitch from going to the bottom of the channel, and, of course, prevent a thorough concreting of the filling. These differences constitute in the main my reasons for the opinion that they are broadly and substantially different in principle and construction.

Int. 8th. Look at the model herewith produced and shown to you, and marked complainant's "Exhibit E," and state whether or not that is a correct model of the construction of the Nicholson pavement according to his reissued specifications, and the drawings thereunto annexed in the various forms therein suggested, a wooden floor-

ing being used in the model as one of the foundations described by him.

Ans. The model produced and marked Exhibit "E" is a correct representation of the Nicholson pavement, (except the filling and coating of tar on the top,) which are left out; I find the flooring of the foundation tongued and grooved in the joints, which tonguing and grooving is usually used in the term flooring. The section of the
217 model marked number one is a representation of Nicholson's first method of long and short blocks forming cells in the model, both long and short blocks are relatively longer than the blocks shown in the sections illustrating the second method. In the pavement I do not understand that there is any difference in the relative length of the blocks in either method of constructing the pavement. Section number two of the model is a representation of the second method of constructing the Nicholson pavement, the blocks being square and of the same size of those used in the first method, as stated in the specification; the short blocks or strips are laid on the side of the fibre, and are in length about one and one-half times the width of the long blocks. Section number three of the model is an illustration of the pavement as shown in figure number three, of drawing number two, of Nicholson's specification, the long blocks being in width three times the thickness of such blocks, and the strips forming the bottom of the channel are of the same length of the width of the blocks. Section number four of the model is a representation of the pavement constructed of long blocks of the width of one and one-half times the thickness of the blocks, and the strips forming the bottom of the channel are of the length of the width of three of the long blocks. Sections number two, three, and four are different models of constructing the pavement on
218 Nicholson's second method, and I have used the terms length, width, and thickness in reference to the fibre of the wood, and not in reference to the form of the blocks, the width of the blocks being taken in a line transverse of the model or street, and the term thickness to the size of the blocks between the channels.

Int. 9th. Look at the model now shown to you, marked the complainant's Exhibit F, in two parts marked complainant's Exhibit F on both parts, and state whether that is a correct representation of Henry Austin's pavement constructed as described in his specification in compartments with the ledges as described by him, and with the blocks fastened on the wooden foundation in a state of preparation to be placed on the roadway before the cells are filled.

(Question objected to as leading.)

Ans. Model F is a correct representation of the Austin pavement, except the filling, as I understand it. The two compartments were partly made by me, and wholly by my direction. It will be observed, however, that the blocks are nailed to the foundation or bottom of the compartment instead of being glued or cemented, as I was unable with the means I had to make them remain in position by glue. These compartments are also strengthened by ledges secured across them underneath, so as to support the compartment

219 while being handled, and support the adjoining compartment when laid in the street; they are also placed across the bottom, so as to support the ends of the compartments when they fit into each other. This was not directed by the specification, but I considered it the best mode of using Austin's ledge, and for that reason so attached it. The ends of the models, which are square, are to be laid in the street on stringers, when constructed in that manner, without the compartment fitting into each other; either or both methods I consider to be within the scope of the specification.

Int. 10th. You stated in your answer to interrogatory number seven that the cells or channels in the Austin patent go down the entire length of the blocks to the foundation, thus making the side support of the blocks depend entirely upon the filling, whereas, in the Nicholson superstructure, about one-half of the distance up from the foundation is a solid wood pavement, and in this condition teams can be driven over the Nicholson pavement with comparative safety to the superstructure for a considerable length of time without any filling. State what is the operation and effect of this in the construction and subsequent use of the superstructure, while the pavement is being completed.

Ans. The effect and operation of this is, that the pavers
220 can use the street for hauling blocks, boards, etc., over the pavement to their advanced work, without waiting for the filling. It gives them more of the street to occupy with material used in its construction between the workmen laying the blocks and those engaged in filling and concreting the channels, which, as I have observed in Chicago, never amounts to less than a half block, and frequently to a block and a half and two blocks. This use of the street, so far in advance of the filling, would, in my opinion, so displace the blocks in the Austin construction as to entirely spoil the pavement.

(Defendant objects to the last clause of the answer as not responsive to the question.)

Int. 11th. State whether or not the Austin pavement, as he describes it, could be practically constructed in the mode stated by you in your last answer; and if you should say it could not, state particularly the difficulties attending the construction of the pavement, according to Austin's mode as described by him, if any, and its disadvantages, if any, in reference to the manner of filling the cells, or of compacting the filling, the consumption of time, or the additional labor or the dangers of displacing the blocks and rendering the pavement defective.

(Objection to question as leading and irrelevant.)

221 Ans. It would be extremely difficult to lay the Austin superstructure on Nicholson's foundation; although within the limits of possibility to do so, it would be impracticable. To avoid this difficulty, Austin directs that his pavement, with the exception of the filling, be made in compartments, and then laid on the street under his method of construction, as much space between the advanced work of laying the pavement, and the filling and concreting of the channels would not be required; a considerable space, however, would be re-

quired to prevent a displacement of the compartments by the process of filling. The blocks being only supported by the glue or cement at the bottom, (in addition to the support of the base of the blocks,) require extreme care in the use of the street before the filling is put in the channel, and in this condition would not be safe to drive a team on to it, particularly if heavily loaded, and the workmen even would be required to walk over it with care until the filling is put in. As regards the filling itself, that also requires care; it would require to be put in lightly, without any ramming; for, unless so put in, the blocks immediately in front of the filling would be displaced, so as to affect the succeeding channel, and also to leave the block or blocks in a
222 condition and position for the sand or gravel to work under them, and thereby present an uneven surface and weaken the pavement.

Int. 12th. State whether or not you regard the foundation or support of the pavement, as described and combined in Nicholson's invention, in his reissued letters patent, set forth and claimed as the same or as different principle from the foundation described by Henry Austin, in any of the methods of constructing his pavement by him in his specification set forth. If you shall say that such foundation of Nicholson is different in principle, as used in Nicholson's combination, from the foundation of Austin, state in what particulars you regard it different, and give your reasons for your opinion.

Ans. I consider the two foundations mentioned different in principle. Mr. Nicholson, in stating the nature and object of his invention, requires a foundation which shall provide against rot, and consequent sinking away from below. In stating the manner of construction, he says: "When the street or roadway has been thus prepared for the reception of my pavement, (referring to the grading,) I then cover the surface of the roadway or bed with tarred paper, or with lime mortar, or hydraulic cement laid over it, about two inches in
223 thickness, or with a cheap flooring, which may be also covered with tar, or any other preventive to moisture can be used for said foundation or support, the object and effect of such support or foundation being to prevent moisture from being absorbed from the ground by the wooden blocks" this I understand to be the section of the specification referred to in the claim where he says, "The foundation or support is to be combined and arranged substantially as herein described." As I understand this clause, he has specified only three kinds of foundation, all of which include the preventive to moisture being absorbed from below. He first mentions tarred paper, without specifying the amount or quantity to be used, but refers to the drawing, from the scale of which we find the foundation to be two inches in thickness. This would probably make an expensive foundation, if laid of that thickness, but in court-yards, or in streets where the travel was light, or on the compact soil of New England a much less thickness would answer the required conditions of the foundat on. The next foundation which he specifies is lime mortar, or hydraulic cement, with a given thickness of two inches. I consider the words lime mortar, as used in this connection, to be only another name for hydraulic

cement. This view is further strengthened by the statement
224 found a little further down in the specification, where he says "moisture is excluded from the wood" by the materials employed for the support of the blocks; lime mortar made from ordinary quicklime would not do this, whereas mortar made with water lime, which is hydraulic cement, would do it. The next foundation which he specifies is a cheap flooring, which may be covered with tar, or any other preventive tomoisture, making the preventive to moisture a required condition in his foundation. It will also be observed that in giving these directions he uses the word with before the words tarred paper; also before the words lime mortar, and before the words a cheap flooring, and not before the words hydraulic cement, thus plainly indicating that the words lime mortar and hydraulic cement are only different names for the same thing, and the description made consistent with itself. In this view of the foundatiou we find all of the methods named fulfil the required conditions of his foundation which are a support or foundation for the blocks and a preventive to the absorption of moisture from below. In the foundation made of hydraulic cement there would of course be no joints in one made of tarred paper; if
225 more than one thickness was used, the joints would be covered, and more than one thickness would of course be used, for even in laying sidewalks, which are not subjected to heavy pressure, two thicknesses of tarred paper are laid in all that I have seen so laid in this city. With regard to a wooden foundation, it specifies a cheap flooring covered with tar; the words flooring include either tounging or grooving or a lining below the joints, which should thoroughly exclude the moisture from below in this foundation. These foundations may be used separately or two or more of them together, as tarred paper on hydraulic cement, or on wood or wood on cement, or in such other manner as would bring the foundation within the requirements of the specification.

Mr. Austin directs his foundation to be made of wood, slate, stone, or iron, and when made of wood, to be made in compartments, having the slabs or boards glued, cemented, keyed, or otherwise fastened together and strengthened by ledges, glued or otherwise secured across them underneath, and in this condition laid down in the street and supported simply by ledges, when the compartments fit into each other, and by longitudinal stringers when they do
226 not. When the foundation is of stone, slate, or iron, the blocks are glued or cemented on to such foundation in like manner as on to wood foundation, and are then laid down or imbedded on the earth or road. There is no mention or suggestion in the specification of Mr. Austin of any preventive to moisture or of any other office to be fulfilled by such foundation other than a simple support to the blocks. There is, however, a suggestion, as I before stated, that there should be in the glue for veneers, a provision that such glue should not be so affected by moisture or such a degree of heat, as to injure the joints. Failing entirely to find in the Austin foundation any preventive to moisture which is essential to the Nichol-

son, and in the Nicholson any ledges or stringers as an additional support, therefore, find them different in principle. I find these differences when both are upon a wood foundation; and in addition to these differences, where stone, slate, or iron are the foundation there is a further difference between them; the Austin, in this respect, being much more expensive than the Nicholson.

(Objection to so much of the foregoing answer as contains a
227 treatise upon the legal or gramatical construction of the specifications as invading the province of the court.)

Int. 13th. State what is the office and effect of the short blocks in Nicholson's combination and arrangement forming cells filled with gravel, tar, or cement concrete.

Ans. The office and effect of the short blocks in the Nicholson pavement is to form a cell or channel in the superstructure of the pavement having a wooden bottom above the foundation, so as to give a side support to the long blocks, and make, as I have before stated, a solid wood pavement about half way up from the foundation, as near as the same can be made solid when made of different pieces of wood, and also to uphold the masses of cement and stone in such cells or channels, so as to prevent the broken stone or gravel or filling from working under the longer blocks, so as to prevent them from upheaving and causing irregularities in the pavement when the filling is rammed down, or by the rolling of wheels over them, and to prevent water from passing down below on the blocks and the foundation. This is the office and effect claimed for them by Nicholson, and they are an essential part of the pavement, and can in no just sense be considered or treated as mere filling of the channels or cells.

(Objection to last clause of the answer as not called for by the question.)

228 Int. 14th. State whether or not you find in the specifications of Henry Austin the short blocks, referred to by you in your last answer, as contained in the Nicholson invention, or any equivalent therefor, and give your reasons.

Ans. I do not find in the specifications of Henry Austin any short blocks or any equivalent for them; there is no mention of any such block or strip of wood in Austin's specifications; in his directions for filling the channels he states that they are to be filled in with broken stone, refuse or broken slate, grit, gravel, or sand, or any hard or any fibrous substances, some woods are hard, and all of them fibrous substances. But he further directs that whatever filling is put in must be cemented or concreted together with lime or cement poured in, or other adhesive liquid material. It is, therefore, evident from the specification that if wood is used as a filling it must be cut up into small portions as the stone is broken up, otherwise could not be formed into a concrete; there is no mention of wood for a filling in such specification, and can only be brought in by the use of the words hard and fibrous substances, which words include a great many other materials, as well as wood. But, as I understand the patent,
229 there is no direction or intimation of filling the channel half way up with one substance, and then changing to another, so

that if by great straining of the specification wood should be used for a filling to the entire height or depth of the filling called for in the specification, it must be of the same material; this view is further strengthened when we see that in Austin's first method he directs that there shall be no fastening or connection together of the blocks.

Int. 15th. State upon what the filling of the cells or channels in Austin's pavement is to rest according to his description in his specifications.

Ans. The filling of the cells or channels in Austin's pavement rests upon the foundation as he directs the spaces or intervals between the blocks to be the entire depth of the blocks.

Int. 16th. State whether or not cotton, wool, flax, and hemp are substances known in the arts as fibrous substances, and whether or not such substances, or other substances of a similar character, would, in your opinion, be or be not equivalents for the filling of the cells or channels within the directions given by Austin in his specifications having reference to those directions, and the purpose to be subserved by said filling as Austin directs it to be made.

230 (Objection to question as leading.)

Ans. Cotton, wool, flax, and hemp are known in the arts as fibrous substances; but I do not consider them or other similar substances as equivalents for broken stone, grit, gravel, &c., for filling the channels, for the reason that such substances would not remain in the channels for any great length of time, even when put in with care by a regular caulker; if put in and compressed tightly such filling could not be cemented by the lime cement or pitch which he directs to be poured in for cementing purposes after the channels are so filled; if put in lightly, so that the cement would permeate the mass, such filling would furnish but a slight support to the blocks, and if put in and thoroughly compacted the filling itself would prevent the cementing materials from passing down into it; he also states that the channels are to be so filled that they will wear equally with the blocks, which direction would prevent the use of any such material. He evidently means, by the use of the general terms, "any hard, or any fibrous substances," such hard or such fibrous substances as will answer the required conditions of his pavement, which these do not.

231 Int. 17. I suppose Nicholson's pavement to be properly constructed, either upon the first or upon the second plan or method described by him according to the calls of his amended specifications annexed to his re-issue letters patent with ordinary mechanical skill and correctness. State whether or not the short blocks in the one case or the strips inserted between the blocks in the other to form the cells, could or not, in your opinion, when such cells are filled with concrete firmly rammed, work up in the common and ordinary public use of such pavement; and state further whether or not you find in the two plans or methods, suggested by Nicholson, any difference in principle in reference to their construction.

Ans. When the Nicholson pavement is properly constructed, as directed by Nicholson in his amended specification, with the filling of

the cells thoroughly concreted within, the blocks in the one method or the strips in the other will work up. I find a difference in the details of construction, but none in principle, between the two methods.

18. Int. Are you familiar with the mode in which the Nicholson pavement has been constructed in the city of Chicago with reference to the strips between the blocks? If so, state what length of strips have been used, and how the same have been laid, with respect
232 to equal bearing of the entire stripe to the flooring and to the crown of the street, and how the mode in which they have been laid would affect the liability of the stripes to work up.

Ans. I am familiar with the construction of the Nicholson pavement in Chicago, and have been during its process of construction, every section or street laid with Nicholson pavement in this city; the first section, laid on Wells street, was laid with considerable care; those constructed subsequently have been laid with less care. The length of the strips used has been about four feet, and have been laid without any filling to the foundation and regardless of the crown of the street, with the exception of being cut and partially fitted in the gutters at the sides of the street, so that frequently the ends of such strips are three-quarters of an inch above the foundation, and I have noticed in some instances where all the variation was at one end of the strip; that there was nearly an inch and a quarter of space between the end of the strip and the foundation. Where so laid there is a tendency to rock the strip, as carriages pass over alternate ends and thereby break up the concrete and make it liable to work out, and eventually cause the strip itself to protrude above the pavement.

Int. 19. State further what, in your observation, has been the manner of constructing the flooring in reference to matching the
233 boards, and whether in practical construction, within your observation, at the point of contact of the boards inequality of surface have been produced; and also state in reference to the Nicholson pavement laid in Dearborn street—you examined the same with one of the counsel for the complainant—and what was there found to be the mode of laying the strips in reference to their equal bearing; their entire length upon the foundation.

Ans. In constructing the foundation with boards in Chicago they are laid on a dressing of sand with the ends supported by transverse boards. At these points the flooring is tolerably even at the joints, but between these points there are hardly any two of the boards of the foundation that are upon the same level at the point of contact; in some the variation is slight; in others the variation is from a quarter to half of the thickness of the boards. In my examination of the Dearborn street pavement with Mr. Goodwin, while it was being constructed, he took this chip, (the witness here produced a pine chip) which is marked complainants Exhibit "G," and stuck it under the end of one of the strips to the entire thickness of the chip after the strip had been nailed down ready for the next course of blocks. I also noticed the same thing with him in the pavement recently
234 constructed on Wolcott street, near the bridge.

Objection, if it shall hereafter appear that any of the above examination was of the pavement constructed, or in course of construction, at the commencement of this suit. The answer as to such pavements will be irrevelant and incompetent. It now being admitted by complainant's counsel, as it respects Wolcott & Dearborn streets, that such pavements were constructed since the commencement of this suit, the above objection is repeated and insisted upon.

P. A. HOYNE, *U. S. Commissioner.*

Int. 20. Having reference to the provisions in the specifications in Nicholson's reissued letters patent, that in some of this mode of constructing his wooden pavement the blocks may be pinned together with wooden pins, and that the strips in his second method are to rest upon the foundation or support with the superincumbent mass of concrete filling pressing them down, state whether, in your judgment, the nailing of such blocks together, or such strips to the foundation, would or would not be a mechanical change as an equivalent, and whether the same would or would not be within the meaning and directions of the specification.

235 Ans. Nicholson states in his specification that in some of his modes the blocks may be pinned together with wooden pins; nails would be certainly a mechanical equivalent to pins for this purpose. I find no direction or suggestion for pinning or nailing any of the blocks to the foundation; but changing the direction of the nails would be a mere mechanical change, such as would suggest itself to any ordinary mechanic; and where a wooden foundation is used would be a mechanical equivalent for nailing the blocks together, such nailing would be within the scope of the patent.

Int. 21. Having reference to the directions given in his specifications by Nicholson, state whether or not it would be a matter of mechanical judgment or otherwise in constructing his wooden pavement, to determine the length of the long and short blocks or strips relatively to each other and the consequent depth of the cells filled with gravel and tar, depending on the location and probable prospective use of the pavement.

(Objection as leading.)

Ans. It would be a mere matter of mechanical judgment.

Int. 22nd. State whether or not in your judgment a wooden pavement, properly constructed according to the directions of Nich-

236 olson's reissued specifications, would wear down in the ordinary and public use of such pavement to the short blocks or strips within the usual lifetime of such pavement, or before or after, as a whole, it would become defective and require to be relaid.

(Objection, as leading.)

Ans. In my judgment such paving would not wear down to the short blocks in its ordinary lifetime, nor before it would need to be relaid.

Int. 23rd. State what familiarity and knowledge you have of the actual use and wear of the Nicholson pavement as heretofore constructed in Chicago, and from your experience and observation and

general knowledge of the art how long would a wooden pavement laid and constructed upon either the first or second plan or method described by Nicolson last as a pavement, and whether the direct or relative durability of such pavement upon either method is subject to conditions; and if yea, what are those conditions.

Ans. The section of wooden pavement laid on Wells street, near the bridge, I think in 1856, is the oldest wooden pavement in the city, and is still a good pavement. The other wooden pavements in the city have hardly been down a sufficient length of time to
237 be used as a basis for an opinion with regard to their durability, but from my knowledge of the durability of wood generally, I should say that such pavement would last from 9 to 12 years when properly constructed, depending upon conditions as to the locality in which they are placed, whether low, wet, or swampy, or a naturally dry soil, and also upon the character and amount of use to which they are subjected. I do not think there would be much difference in this respect between the first and second methods of Nicholson's construction. If there should be any difference I think it would be in favor of the second method, as that presents more wearing surface of wood than the first method.

Int. 24th. State what, in your opinion, would be the durability of a wooden pavement, constructed in all particulars, as described by Henry Austin in his specifications, defendant's Exhibit "G," having reference to the whole mode of construction, and the use and wear of such pavement, and state your reasons for any opinion you shall give concerning the same.

Ans. A wooden pavement constructed on the plan and specifications of Henry Austin would, in my opinion, last from three to five years when subjected to heavy travel. My reasons for this opinion are, that when blocks are laid, as directed by Austin, depending
238 for their support only upon the substance used to attach them to the foundation, the breadth of the base of the block and filling, with no side support other than the filling, would soon become displaced, particularly when subjected to heavy use. I have noticed in all of the wooden pavements in Chicago that but very few of the courses of blocks, except at street crossings, stand were they were originally laid. On Clarke street some courses in the centre are moved fully two feet since they were laid, and the pavement is still in tolerable condition. If this pavement on Clarke street had been laid on the Austin method, there would be hardly a block standing on end in the whole street, for when one block gives way in the Austin, two or three more will follow in the next course, and go on increasing in this ratio till the blocks are all displaced and lying on top of the filling. It would be exceedingly difficult, if not impossible, to so attach all of the blocks in the Austin pavement to the foundation, that none of them would move under the feet of horses drawing heavily loaded vehicles, which movement of the blocks would permit the working of sand and gravel under the blocks, which would increase the movement of the blocks, and thereby permit coarser gravel or particles of stone to work under and soon displace

239 the blocks, as there is no foundation to Austin's cells above or different from the foundation of the pavement, to prevent this operation of the filling after the movement of the blocks had broken the concrete.

25th int. What would be the effect of toe-nailing in place of the substances used to attach the blocks to the foundation referred to in your last answer in Austin's patent, and to what extent, if any, would such substitution of toe-nailing relieve the difficulty you have spoken of in your last answer.

Ans. In toe-nailing the blocks to the foundation, it would be almost impossible to toe-nail them except upon one side and one end till you came near the curb wall, when the toe-nailing at the end would have to be omitted. I think the blocks when so toe-nailed, would be stronger on the side where the nail is drawn in, but weak on the other side, so that practically it would not improve the pavement in the respects mentioned in my last answer.

26th int. State what effect, if any, on the wear of the said Austin pavement, and its durability, would be due to the want of any preventive to moisture from below in its foundation.

(Objection as leading and suggestive.)

240 Ans. The effects which I have described in my two last answers were upon the supposition that the foundation remained sound; there being no preventive to moisture in the foundation, and no material protection from water, it would consequently decay soon, and besides preventing the defects and difficulties consequent upon the giving way of the foundation, would also aggravate those I have named before, and make the pavement still less durable.

27th int. Are you acquainted with, and have you examined, the small piece out of the Nicholson pavement at the intersection of Clark and Randolph streets, designated on defendant's map of that intersection, marked A and B Exhibits in this case, of that intersection? and have your examined, and are you familiar with, the portion of pavement taken up from said intersection, and marked defendant's Exhibit A, to Thompson's deposition? If yea, state how the said piece of pavement, being about 6 feet wide wide and 16 feet long, across Randolph street, is constructed, and whether or not, either in the manner of laying the same or the foundation, or the filling, it is constructed according to the directions and specifications of Henry Austin, or otherwise, and upon what method or plan of pavement the said specimen is constructed.

241 Ans. I am acquainted with the intersection designated on the map, and with the specimen, so far as it has been taken up. A strip about 8 feet long was taken up out of one side of it by Mr. Thompson in my presence, and in presence of several other gentlemen, counselors in this case, solicitors in the case. I think courses of block were taken out in the middle, four at the north end, and three at the south end. The portion described on said map by meets and bounds, was not constructed according the direction of Austin's specification, in this, that the foundation was not in compartments, nor had such foundation any ledges or stringers for an additional sup-

port, and was entirely covered with tar, which Austin nowhere directs. The blocks were nailed to the foundation, while Austin directs them to be glued or cemented, but this I should not consider a material departure. The filling of the channels was substantially within the specification of Austin. The top of the blocks had been covered with tar, which Austin nowhere directs. I was present at the time the specimen mentioned was taken out by Mr. Thompson. The specimen contains five courses of blocks. I think it is five. It is some time since I saw it. I think there is two channels of Nicholson, and two channels of what is called Austin, or without
242 any short blocks or strips; the rest of the specimen is on the plan of Nicholson.

28 Question. If the street were to be laid with a pavement constructed like the piece 6 x 16 at the intersection referred to; that is, not in compartments, and with the blocks toe-nailed, state whether or not any difficulty would occur, in practice, in respect to the facilty or capability of repairing it, or of relaying it, when taken up for the purpose of laying gas-pipes or water-pipes, or other municipal purposes.

Answer. When a pavement is laid like the piece mentioned, with the blocks toe-nailed to the foundation, there would be a difficulty in relaying the blocks when taken up for repair, or any municipal purpose, as it would be impossible to toe-nail the last course of the section repaired, and exceedingly difficult to nail the two or three courses next to it, so that, necessarily, a strip would be left without any attachment to the foundation, in such cases of taking up or repairs.

29 Question. You have referred to the swaying of the courses of blocks of the Nicholson pavement on Clark st. State at what part of Clark st. such swaying occurred, and what was the cause of its taking place to so great a degree at that locality, and also whether or not there would be, in the practical construction of wooden block pavement upon all newly filled streets, a liability to such swaying. If yea, from what cause; and state how such cause would op-
243 erate to produce such effect. Explain this fully, and whether or not such liability would exist when the Nicholson pavement is properly laid upon a thoroughly settled and prepared road-bed.

Ans. The greatest swaying that I have noticed on Clark street occurs just north of the intersection with Washington street. It occurs, to a considerable degree on all of the city blocks, between the street intersections, the entire length of the pavement on that street. The cause of its taking place to so great a degree at that locality, in my opinion, was from the settling of the road-bed after the pavement was placed on it. The street was brought to grade by about three feet of filling, and in the haste to get the use of the street the pavement was completed as fast as the street was filled, consequently the settling took place afterwards. At the street crossings the pavement, not being confined in any direction, and the courses of the blocks being mitred, the blocks and courses at these street intersections have remained in the position in which they were originally placed; but between these intersections the pavement, being con-

fined on two sides by the curb walls against which the ends of the course of blocks rested, and the blocks themselves being placed against each other in the courses, could not settle in the same direction as the foundation, and were, therefore, forced off from one side or the other from the straight line in which they were origi-
244 nally laid. This is my opinion of the cause, and the theory of the peculiar effect produced, and, in my judgment, is the reason why we find the courses so swayed, and worse in Clark street than any other, as less time was allowed on that street for the road-bed to settle than was allowed on any other street upon which a wooden pavement has been placed. After a road-bed had been thoroughly compacted, so that no further settlement would take place, I think no swaying of the courses of blocks would occur when the pavement was properly constructed; but on all newly formed streets this swaying of the courses would occur to a greater or less extent, according to the settling of the road-bed.

30th Int. Have you examined, and are you familiar with, the patent specifications of David Stead, of England, as shown with the drawings in defendant's Exhibit "B," annexed to the stipulation in this cause?

Ans. I have examined the specifications of David Stead referred to, and am familiar with them.

31st Int. State whether or not you find the Nicholson invention and combination, as set forth in his reissued letters patent and specifications, in the said specifications of David Stead; and state particularly in what respect you find the two patents identical, or dif-
245 ferent in principle, as the same are set forth and described in the said specifications respectively, and give your reasons in full for any opinion you shall express in regard thereto.

Ans. In my answer to the seventh interrogatory I have given what I understand to be the combination of Nicholson as set forth in his reissued letters patent, and need not again repeat it. I find in the wooden block pavement of Stead a variety of forms for the blocks given. I do not find, either in the drawing or specification, any foundation other or different than the prepared road-way brought to a suitable figure. I do not find any foundation or support for the blocks upon such prepared road-way. I am aware that he uses, in his specifications, these words: "the foundation being first suitably prepared to the required figure by the usual well known means, to receive such wooden blocks." I understand this to refer simply to a foundation prepared from natural soil or earth of such road-way. This view is further strengthened in the plan shown by Stead, at figure 18 or 19, where the spaces between the blocks are filled by piles driven down, which piles, if we apply the same scale that we have used for Nicholson, that is, 8 inches for the blocks, will be 20 inches long, which form of pavement it would be impossible to use if a concrete foundation or plank foundation, or any other suf-
246 ficiently strong to support the blocks were used; and he uses the same foundation for all of his forms. The blocks in the forms shown at figures Nos. 21 & 22, of which Exhibit H is a correct

representation, are so cut away at the sides as that, when laid in the street, channels will be formed around each block, in debth one-third of the length of the blocks, as shown in the drawing. The bases of the blocks, when laid, are brought in contact with each other, and he directs that these channels may be left open or filled up with cement, leaving a slight space unfilled at the top. The blocks made by Stead in this form are much more expensive than the Nicholson, long and short blocks, from the greater amount of time consumed in making them, and from the waste of material by such construction. The blocks so formed, would not, in my opinion, wear equally well with the blocks in Nicholson's first method, for the reason that the wearing surface stands wholly unsupported by the other blocks, leaving the exposed ends to become shattered and exfoliated, particularly when the channels are unfilled. These channels run transverse and longitudinally in the street, without break, so that the longitudinal channels would very soon form gutters or ruts, under the action of carriage-wheels, and in this respect the channels or spaces differ in principle from the cells or channels of Nicholson.

247 This form of a block, where channels are to be formed in this manner, seems in some respects to be a necessity where blocks are used without a supporting foundation, as in this case, in order to give them a broader base to rest upon a simple road-bed. I find the Stead pavement to differ from the Nicholson in principle in its entire lack of a foundation either to support the blocks or to prevent the absorption of moisture from below. I find the differences in principle in the channels or cells, as before stated, in figures Nos. 21 & 22, which are the only ones in any degree approach the superstructure of the Nicholson pavement. In his first method I find also a difference in the filling, which, if I understand the Nicholson correctly, amounts to a difference in principle, as Stead only mentions a filling of cement, which it is wholly immaterial whether put in or not, and as a simple cement, whereas in the Nicholson, the filling is a hard concrete, and a necessary part of the combination. I therefore find that the Nicholson and Stead pavements are identical, only in both being wooden block pavements, while in combination and construction they differ entirely in principle and in detail, and do not find the Nicholson combination in the Stead specification.

Int. 32d. Look at the model now shown you and marked
248 complainant's Exhibit H, and state whether the said model correctly illustrates the block shown in Stead's figure 22, and also the section of blocks as a plan, as shown in figure 21, both as to the form of the blocks and the matching and joining them together in this method of Stead's pavement, and is said model constructed upon the proportions and to the scale of said drawings in figures Nos. 21 & 22?

(Objection, as leading, and as assuming facts which are not established.)

Ans. Question withdrawn by complainant's counsel.

33d Int. Look at the model here shown to you and marked complainant's Exhibit H, and state what said model illustrates?

Ans. Exhibit H is a correct representation of the plan of 9 blocks, shown in Stead's figure 21, and the blocks, separately, are correct representations of the form of blocks shown in Stead's figure 22. I brought the blocks to the required scale, adopting as a scale blocks 8 inches in length, the same as used in Nicholson. The blocks in the model are a trifle over one-half the size of Stead's blocks, providing the scale is correct. The form of the blocks, the debth, and the size of the channels are correct in their proportion, be the scale as it may.

34th Int. In your answer to interrogatory 31st, above, you
249 say, "I find also a difference in the filling, which, if I understand the Nicholson correctly, amounts to a difference in principle." Please state what is your understanding of the filling called for to satisfy the description and the declared purpose of Nicholson's specifications. And also whether you find described in Stead's specifications any filling of the cells or channels between his blocks equivalent to the filling required by Nicholson's patent.

Ans. Nicholson, in his specifiation, directs that "the cells or channels be filled up with small broken stone or coarse clean gravel, the whole being firmly rammed, so that the upper surface of the mass in such cell shall be firm and level." "He then directs that the ramming mineral or vegetable tar or pitch is to be poured over the whole surface of the pavement, and into the cells or cavities containing the broken stone or gravel, so as to penetrate entirely between the pieces of broken stone or gravel, and cement them together," "so as to cause the stone to adhere firmly to the surrounding blocks and form a mass, which, by the weight of the carriages passing over, will expand and fill such spaces, even though the blocks should shrink." A little farther on in the speci-
250 fication, he says, "instead of broken stone and tar any other suitable cementing material, or cement may be employed in in the cells." He prefers, however, "common tar or pitch," "with the gravel or broken stone;" by the use of the words, any other cementing material or cement, I understand him to mean, that such other cementing material may be employed in the cells in the place of the mineral or vegetable tar or pitch which he has specified, and which, in the first instances he calls cement, and almost immediately after the use of these words, other suitable cementing material or cement, he says, "the shorter blocks serve to support the masses of cement and stone in the cells or cavities, so as to prevent particles of the broken stone or gravel from working under the longer blocks," making it evident to my mind that he does not intend to convey the idea that broken stone or coarse clean gravel or equivalent substances are to be left out of any of his forms of cement for filling such cells or channels. This view is further strengthened by the expression found still further down in the specification, when describing his second method of constructing his pavement, where he says, "such cells or grooves are subsequently filled with broken stone, or gravel and tar or cement," evidently using the cement as an equiva-
251 lent for the tar only. I find also in the claim of the specifica-

tion, he claims the long and short blocks combined with such cells or channels filled with broken stone, gravel, and tar, or other like material, substantially as described, clearly indicating that his filling is a hard concrete, entirely filling the channel. I do not find in the Stead specification any filling which is an equivalent for the Nicholson filling; the only filling which he mentions, except small blocks of wood in some of the other forms of his pavement, is simple cement or ashpalt, without being concreted with anything, and he directs that the cells in all of his forms shall not be filled entirely to the top. It is for these reasons that I considered them in the filling different in principle.

35th int. What does Stead direct the channels to be filled with, in his method described in figures 21 and 22?

Ans. In his description of the form shown in these figures, he says: "These channels may be left open, or so filled up with cement, as to leave a slight space unfilled beneath the top surface to afford a hold for the horses feet," by the shading of figure 21, and the open spaces of figure 22 we find the channels unfilled in the drawing.

252 36th int. In which of the other plans and methods given by Stead, does he direct a filling of cement or ashpalt?

Ans. The form shown in figures 16 and 17 is the only other one shown where he directs the use of cement for filling the spaces, and the only one where he directs the use of ashpalt; the cells in this form go to the bottom of the blocks.

37th int. Look at the model now shown to you, and marked complainants Exhibit I, and state what that is an illustration of.

Ans. Exhibit I is an illustration of the form of Stead's pavement, as shown in figures 16 and 17, being the same number of blocks shown in the plan view, figure 16.

38th int. State what, practically, would be the effect in a pavement, constructed as described by David Stead, in his figures 21 and 22, or his other modifications, in reference to the prevention of water from passing down from the surface of the pavement, and also in reference to the operation of the wheels of carriages upon the filling described by him?

Ans. In Stead's plan, shown in figures 21 and 22, if left unfilled, as he shows them in the drawing, and says they may be left, there would be nothing to prevent the water from passing down between the blocks, if filled with cement or ashpalt, which he says

253 may be used for his form shown in figure 16; the joint of the blocks being in the middle of the channel, such filling would probably for a time prevent water from passing from above into such joints between the base of the blocks. In some of his other forms he uses wooden blocks and piles for filling, and in these forms, although the interstices are filled, there is nothing to prevent water from passing down through the joints. In the forms shown at figures 21 and 22, the action of the carriage wheels would soon destroy the filling mentioned by Stead, in the longitudinal channels, so that they would very soon be in a condition for water to pass through the joints, although originally filled, as he says they may be.

39th. What do you find to be the purpose and object of Stead? in creating channels or grooves, or unequal surfaces in such forms of his pavement, given by him containing them?

(Objection, as calling for a construction of contents of written instrument, and for matter irrelevant, incompetent, &c.)

Ans. The only purpose or object which he mentioned is to afford a hold to the horse's feet.

40th int. State whether or not such office and object is the one practically subserved by such channels or grooves or uneven surfaces, so described by Stead?

(Withdrawn.)

254 Ans. That is the object practically subserved, and, as I understand the specification, the only one intended, for the reason that he directs that they may be left open or filled at pleasure.

(Objection to last clause in the answer, and to the reason given as volunteered by this witness, and not called for by the interrogatory.)

X 1st int. Are you familiar with, and have you examined, the patent specifications of Thomas Wood, the younger, being defendant's Exhibit "C," annexed to the stipulation in this cause.

Ans. I am familiar with, and have examined, the specifications of Thomas Wood, the younger, in his English patent, contained in the exhibit referred to marked defendant's Exhibit "C?"

X 2d int. Do you find in the patent specifications of said Wood the Nicholson's invention and combination, as shown in his reissued letters patent, and state in what respect you consider the said pavement described by said Wood identical in principle, or different in principle, from the pavement described and claimed by the said Nicholson, in his said reissued letters patent, and give your reasons for any opinnion you shall express in regard thereto?

Ans. I do not find the combination of Nicholson in the specification of Wood. I find them identical only in these respects, that
255 they are both wooden block pavements, and in the superstructure of the pavement, (that is the part above the foundation,) I find in both long and short blocks, and in one of Wood's variations, the long blocks are considerably taller from one to three inches, more or less, and the channels or spaces filled with concrete made of some bituminous substance heated and mixed with gravel, sand, or other like material. This variation of Wood appears to be the same in principle as the modification of the blocks in the superstructure of Nicholson second method. Further than this I do not find any identity of principle between the two; I find them different in principle in respect to the foundation, which is entirely wanting in Wood, either for the purposes of support, or for the purpose of preventing the absorption of moisture from below by the blocks of Wood's pavement. Wood depends for a foundation upon the peculiar form of his blocks, which are cut at particular angles, and so laid as to support themselves, so that any foundation of mere shingle, gravel, or sand, will do, (using the word shingle as a name for beach gravel.) The peculiar form of Wood's blocks are made in sections of pyramids and double-wedged forms cut at an angle from seventy

to eighty-eight and a half degrees; whatever angle is adapted
256 at or between these limits, must be used for all of the blocks in the same pavement. The channel formed by Wood, where he makes the largest variation between the length of his long and short blocks, differs in several respects from the channel formed by Nicholson's long and short blocks, as the channel so formed is broader at its base than at the top. The action of the carriage wheels upon the filling is farther removed from the joints between the long and short blocks than it is in Nicholson. The top of the longblocks projecting over the short ones are very liable to be split off by heavily loaded teams passing over them, thereby destroying the side support of the filling, and leaving the filling loose in the channels to be worked out by the horses feet. His channels, as shown and described, being very much wider than the channels of Nicholson's second method, as he has no direction for cutting his blocks other than all of the same size, which would bring the channels of equal width with the wood surface between them, except the difference produced by the angle of the blocks; the blocks of the longer courses (as he has shown them) in figure "K" being laid on the apex of the pyramid, that is with the base upward the apex, being cut off, the bearing surface of the double wedged blocks is alike at both ends, and the blocks of the shorter course being laid the reverse, that is with the base
257 downwards. Any settling or displacement of the short blocks will open the joints at the sides of the channels, so that sand or gravel can pass down between the blocks long before the short blocks have been down below the bottom of the long blocks, whereas in Nicholson, the joints at the sides of the channels will not be opened by any settling of the short blocks until such short blocks have passed entirely below the long ones. These differences would be more apparent if the Nicholson superstructure was laid on Wood's roadway without any further support than mere sand or gravel. If such a displacement should take place in the Wood's pavement, the form of the blocks and the manner in which the long blocks are laid, would cause them to work out with a less use of the street when gravel worked into the joints between the long and short blocks than in the form of the block used by Nicholson. Wood claims in his specification that the peculiar form of his blocks by the use of the street will wedge or compact blocks together, so as to prevent all displacement. This would be true, if the parties using the street would always take the pains to drive on the blocks which had the broad end upwards, but when the weight of the loaded trains came on the
258 double wedged blocks or the pyramidal blocks which stand upon their bases, a reverse effect would be produced which, in my opinion, would produce in the use of the street a continuous movement between the blocks to a greater or less extent, which would facilitate the working of sand and small gravel between the blocks, and also break up the concrete in the channels, so that, at the least, there would be a break in the filling of the channel at each joint of the blocks forming the bottom of the channel, so that water could pass down freely, which would constitute very material differences between

the channels (and the effect produced upon them) formed by the long and short blocks of Wood and those formed by the long and short blocks of Nicholson. The channels shown by Wood in his figure H cover about ⅔ of the entire surface of the pavement, when laid in this form shown in the figure. The difficulties which I mentioned in wedging the pavement by the weight of the teams passing over it, in the form shown at the figure K, are obviated, as only those blocks which are laid with the base of the pyramid upwards project above the channels, which form of laying the pavement, however, as I stated before, leaves ⅔ of the pavement in the channel. For these reasons, above-stated, I find the pavement described in Wood's specification, and the pavement described by Nicholson in his amended specification to be different in principle and in construction and effect. I find in Wood's specification the peculiar forms of the blocks to be an absolute necessity to the pavement constructed by him.

259 43 int. Look at the model now shown to you, marked complainant's Exhibit "K," and state what it illustrates.

Ans. The block in model "K" illustrates figure "K" of the drawing attached to Wood's specification, with the exception of the half blocks, shown in the drawing, designed to produce vertical lines, where such lines are necessary, as against curb-walls.

44th int. State whether or not you find in the Wood patent specifications a special form of blocks as an essential element of his combination, and for a special object and purpose described. If you shall state you do, state further, whether or not you find that element in the Nicholson combination, or whether or not you find in the latter a different form of the blocks, new as to Wood's patent, and a substantial departure from Wood's special forms, resulting in new effects. If yea, state what those effects are in reference to the practical use and operation of the pavement, and also in reference to the facility or cost of the construction; and in this connection, state whether or not you find a practical benefit in the form of the blocks adopted by Nicholson in his combination.

(Objected to, on the ground as leading, suggestive, and irrelavent.)

Ans. I do find in Wood's specification a particular form of block. Wood says, "blocks I use for paving are of two forms, viz., the section of the pyramid, having either a square base or an elongated base, and the double wedge cut from either a similar square base,

260 or a similar elongated base." He confined himself to no particular dimension for the blocks, except that the section of pyramids must all be cut at the same angle. His entire specification has reference only to these two forms of blocks, and in all the modifications of his pavement the same forms of blocks are made a necessary part of the pavement, and I find these forms of blocks used for a special object and purpose, that is, to wedge the road together with any degree of intensity, so as to prevent any displacement and give it a complete firmness and solidity, and to make all the blocks lean and press on each other on all sides, in mutual support. In his summing up, he claims the peculiar combination, construction, or arrangement of the blocks of those forms which he has specified, which are the two

forms before named by me. I do not find these forms of the blocks in the Nicholson combination. I find a different form of blocks in the Nicholson, new as to Wood, which are substantial departures from Wood's forms, and produce different effects. One difference in effect I have before given, in stating the difference between the sinking of the the short blocks between the two, in my answer to the 42nd interrogatory.

It would also be impossible to make a substantial pavement out of the Nicholson blocks on Wood's foundation. The Nicholson blocks are made in the cheapest manner in which it is possible to
261 make blocks, whereas Wood's blocks are expensive in their manufacture, requiring a skilled workman to make them, as they must all be made alike, (when the size and angle has been adopted,) and the forms used by him require resawing in at least four of the six sides of each block, making great waste of material, and consuming a large amount of time in preparing them ready to be laid on the road-bed. I therefore find a practical benefit arising from the forms used by Nicholson.

45th int. State how much, in your opinion, of the peculiar properties of Wood's pavement, both in respect to the ability to dispense with a foundation other than the prepared surface of sand and gravel, and also of the peculiar difficulties and defects you have alluded to in your previous answers, are due to, or the results of, the use of such special forms of blocks spoken of in your last answer, as used and claimed by said Wood.

(Objected to as irrelevant.)

Ans. I consider them entirely due to the form of blocks used and claimed by Wood.

46th int. Look at the model now shown to you, and marked complainant's Exhibit "L," and state what it illustrates.

Ans. Exhibit "L" is an exact illustration of the form of pavement shown by David Stead, in his figures 18 and 19, which has a pile filling the blocks, and pile of the model are full size, using the same scale for Stead that we have used for Nicholson, that is, using blocks 8 inches in length.

262 47th int. Have you examined, and are you familiar with, the patent specifications of John Perring, being defendant's Exhibit "E," attached to the stipulation in this cause?

Ans. I have examined said specification, and am familiar with it.

48th int. State whether or not you find in the said specifications of John Perring, the invention and combination of Nicholson, as set forth in his reissued patent and specifications, and whether or not the pavement described by the said John Perring in his specifiations is identical or different in principle from the combination and invention described and claimed by the said Nicholson in his reissued specifiations, and give your reasons for any opinions you shall express in regard thereto.

Ans. I do not find in the specifications of John Perring the invention and combination of Nicholson, as set forth in his, Nicholson's, reissued letters patent. I find them identical in respect to both being

wooden block pavements, but in method of construction and detail, I find them different in principle. Perring mentions in his specification a particular size for his blocks, when they are to be laid upon a concrete or other artificial substratum, in a place where the traffic is considerable; this is the only mention of any foundation which I find in his specifications. The foundation which he mentions is only for a support to the blocks, there being no mention or suggestion
263 that it is to be made so as to prevent the absorption of water from below by the blocks, and he clearly indicates by the words used, and the manner of using them, that unless the traffic is considerable, no foundation is required fer his pavement other than the natural soil. The blocks of his pavement are cut from timber about six inches square at distances of six inches, so that when the block is placed in its proper position the vertical depth of the block will be about equal to the depth of the timber from which it is cut. They are cut at an angle with the timber of about 45 degrees; but he says the angle may range from 40 to 80 degrees, which angle he considers an important feature of his pavement, as thereby the blocks support one another, and enable him to use young or open-grained timber. These blocks are pinned or pegged together at the centres of their slope sides and at the centres of their vertical sides by pegs and pins, not less than one inch in diameter, when the blocks are to be laid upon any artificial substratum. In his forms, shown at figures 11 and 12, plan views, and 9 and 13 sectional views, thin slips of wood are placed between the sections of blocks, for the purpose, as he says, of separating the blocks, so that a secure foothold may be
264 afforded to horses and other animals, without reducing the substance of the blocks. The pins by which the blocks are fastened together pass through these slips of wood. The holes in these slips of wood are to be made as much larger than the pins as will admit of a little play, so that each mass or slab may take the required curve across the cariage-way—referring by the words mass or slab to his previous directions to pin from 16 to 24 blocks together in slabs or masses—before putting them on the street. The slips which are inserted between the blocks are made so that the fibre or grain of the wood will run horizontally, and may be made in length the width of a single block, as shown in figures 9 and 11, or of the width of four blocks, as shown in figures 12 and 13; they are to be about one inch in thickness and to come in about one inch of the upper surface and one inch of the lower surface of the blocks, so that either surface may be laid upwards when placed upon the street. There is not only no direction for these slips to rest upon the foundation, but a positive direction against it. He also states that slips of wood may be fixed, by similar means, to the slope sides of the blocks. He states that other elastic substances beside wood may be used
265 between the blocks, for the purpose of affording a secure foothold, as stated in his claim. It will be obvious that these slips of wood are in no sense an equivalent of Nicholson's short blocks or strips of wood which rest upon the foundation, and form separate wooden bottoms to the cells, for the purpose of upholding the mass

of the concrete and preventing the particles of broken stone or gravel from getting below the long blocks and preventing water from passing below.

Perring nowhere specifies or directs that the channel an inch square above and below, in his pavement shall be filled with anything; and if so filled the slips of wood, resting solely upon the dowell pins, would not afford a sufficient support for any concrete or other filling which formed a part of the pavement. The slips, according to the specification, are about one inch in thickness and four inches wide, with holes, which are to be over one inch in diameter, as he directs the holes to be larger than the pins, and the pins to be not less than one inch in diameter, leaving in strength less than three inches of the slips at these points, so that they cannot be intended in any manner to support vehicles passing over them, but are simply what he claims for them, slips to part the blocks, so as to afford a secure foothold to the horses, from all which it will appear that the two pavements differ in principle in the foundation and in the superstructure. There is no preventive to moisture either in the foundation or superstructure.

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49th int. Look now at the model shown to you, and marked complainant's Exhibit "M," and state what it illustrates.

Ans. Exhibit "M" correctly illustrates the four courses of blocks shown in figures 11 and 12 of the drawing annexed to John Perring's specification, so far as the blocks are concerned, they being cut at an angle of 45 degrees across the grain of the wood, as directed in the specification. Two of the strips correctly represent the long strips (the witness says he means slips instead of strips) shown in figure 12, and in one course the short slips shown in figure 11; and also correctly represents the dowell pins and holes in the slips and the blocks, the scale being $\frac{1}{3}$ full size, and the mode in which they are put together, represents the upper and lower surfaces alike, as directed.

50th int. State what substances would be called for to be used in place of the wooden slips specified by Perring, under the phrase "other elastic substances," as equivalent for the wooden slips, having reference to the directions given by Perring in his specifications, and the purposes and objects to be subserved by such slips, as specified by said Perring in his specifications; and also whether or not, in your opinion, any substances having the additional property of a preventive of moisture, would or would not be within the calls of said specifications of Perring.

267

Ans. It is somewhat difficult to state what other substances would answer the requirements of a pavement, as I believe, with Mr. Perring, that no other could be found as good. If the substances used had more elasticity than wood, the dowell pins would soon be broken, and without such breaking of the pins the pavement would be loose upon the street. If any very elastic substance were used, it would, therefore, require some substance nearly equal to wood in density and elasticity; whatever substances might be used, there would be no preventive to water passing below, as the channel, being unfilled,

would hold the water so as to cause it to pass down in the joints between the blocks, if prevented from passing the joints between the slips and blocks. If short strips, as are shown in figure 11, were used, no substance, however elastic, would prevent water from passing below in the channels. Substances having in themselves the additional quality of preventig moisture, I believe, might be within the call of the specifications.

51st int. Suppose that the substances of cork or India rubber were used for these slips in constructing Perring's pavement, state what would be the practical effect of such use, having reference to the
268 directions given by Perring as to the manner of constructing the pavement on the street, with such slips placed as he directs them to be, and being upon dowells or wooden pins, with a hole sufficiently larger to admit of such play as that the mass or slab would, in use, conform to the curve of the street; and also whether or not, when so constructed as aforesaid, water would be prevented from freely passing down from the surface of the pavement to the bottom.

(Objected to as irrelevant.)

Ans. I do not consider cork or India rubber to be within the meaning of the words used by Perring, or within the scope of the patent or specifications. The only object which he specifies that he has for inserting such [such] slips is to separate the blocks, so as to afford a secure foothold for the horses. He evidently does not mean that such substances shall be used as would entirely destroy his pavement. A single hot day would ruin India rubber slips; and cork, being only a bark, could not be obtained in sufficient size to be used for slips, except of the size shown in figure 11, and would be so expensive as to preclude its use for paving purposes, although, being simply a slip, it might serve to spread the blocks, as Perring evidently intends that there shall be no vertical strain or pressure upon such slips; but being used in such short sections, it would be no preventive to water passing below. The pavement being required to be placed
269 together loosely so as to take the curve of the street, such bending of the masses or slabs to the curve would of itself open the joints, the hole in the slip being required to be larger than the diameter of the dowling pin. Short slips, as shown in figure 11, being supported only by a single pin, will turn on such pin and leave an open space between each one of said short slips in the channel; and when the slips are made of longer pieces, so as to rest upon four pins, they are required to be loose, in order to give the pavement a little play; and when made of soft elastic substances, like India rubber, such slips will sink between the pins; and when made of frail substances like cork, would break from any vertical pressure which might arise from filling the upper channel with street dirt, the lower space being entirely empty.

52 int. Have you examined and are you familiar with the patent specifications of Joseph Crannis and Robert Kemp, defendants' Exhibit F, annexed to the stipulation in this cause?

Ans. I have examined said specifications, and am familiar with them.

53 int. State whether or not you find in the said specifications of Crannis & Kemp the Nicholson invention and combination, as
270 set forth in his reissued letters patent and specifications, and whether you find the pavement described by said Crannis & Kemp in their said specifications identical with, or different in principle from, the pavement described and set forth by Nicholson in his said reissued specifications and claimed by him, and give your reasons for any opinion you shall express in regard thereto.

Ans. I do not find in the specification of Crannis & Kemp the invention and combination of Nicholson, as set forth in the specification of his reissued letters patent. I find them identical in respect to both being wooden block pavements, and in some forms resting upon a prepared foundation. I find, however, the foundations different in principle; the foundation of Crannis & Kemp being made of three-inch plank, with the ends of the planks secured together by a double bevel, with stringers at the curb wall, where the road is to be laid on a dry soil; and in other localities the plank are to be supported by stringers at all of the joints. I find in their foundation a provision only for support, there being no provision against the absorption of moisture by the blocks from below; but I do find that small vacant spaces are left between the sides of the planks for the purpose of drainage, evidently showing that it is their inten-
271 tion to have the water pass through their pavement; and the same arrangement which permits the water to pass through would permit it to pass up when placed in low or very wet localities. There is no tarred coating or other preventive to moisture anywhere used, or directed to be used, in their foundation. The foundation, therefore, differs in principle with the Nicholson in the arrangement for drainage, which is not in Nicholson, and in the preventive to moisture which is in Nicholson, and not in Crannis & Kemp. There is no sub-foundation or stringers in the Nicholson which are found in Crannis & Kemp. The Crannis & Kemp foundation is also a very expensive one in the superstructure, in the form of blocks, shown at figures 19, 41, 42, 61, 63, 69, 72, and 75. I find long and short blocks.

I find by refferring to the specifications that the short blocks are only a little shorter than the long ones, and are methods which they have adopted to avoid grooving blocks, so as to afford a good foot holding, which will be apparent by refferring to the second clause of their claim, where they claim the methods therein described of groov-
ing or placing the blocks high and low to form grooves and
272 stops. The channels so formed by the long and short blocks are only equivalent to the grooves in their other forms of blocks, being all shown and described of the same debth, with the exception of figure 41; the short blocks are only about $\frac{1}{3}$ the thickness of the long blocks. In figure 41 the grooves are formed by rounding the sides of the thick blocks, so as to bring them a little lower than the thin blocks, all of them being variations of their idea of forming grooves.

The only superiority which they claim for long and short blocks

over full blocks grooved is, that in making them in the way (long and short) there is a great saving both of material and labor in comparison with the plan of cutting out grooves in the solid faces of the blocks. There is no mention anywhere in their specification of any filling for these grooves or any preventive to moisture passing into the joints, and there could not well be any filling in these grooves, as they say in their specification blocks of four or five inches deep laid upon their foundation will generally be strong enough for all purposes of travel, although they say they do not confine themselves to any particular dimensions, specially in respect to the thickness of the blocks. Taken the dimensions given as the scale of the drawing, the grooves formed by long and short blocks, or cut
273 in the solid faces of the blocks, will be $\frac{5}{8}$ of an inch in debth, when four-inch blocks are used and 25-30 seconds, being a small fraction over $\frac{3}{4}$ of an inch in debth, when the blocks are five inches. These grooves, even when the sides are vertical, as shown in figures 60, 61, 72, 75, and others, would not be capable of retaining filling for any length of time; while those formed with the sides inclined outward from or near the bottom of the groove, as shown in figures 62, 65, 68, 70, and others, would not hold it under any pressure of horses' feet, as the calks in the horseshoes would work it out. The form of groove shown at figure 74, which is cut in the solid block, would probably hold it for a while, but would be subject to the same infirmities as those which I have mentioned as incident to Woods, the younger; any filling, however, is entirely outside of the specification.

I therefore find the superstructure of Crannis & Kemp different in principle in the superstructure, and the combination of blocks with the foundation different in principle from the Nicholson. At this point I desire to add that Crannis & Kemp state that in some cases the lower planks of their foundation may be dispensed with altogether by cutting a groove along the faces of the upper planks, which abut against the curb-stone, and inserting a long fillet or
274 dowell into these continuous grooves; and that several forms of their pavement as shown in figures 13, 14, 17, and 18, sheet "B," are laid without any foundation at all other than the bed of the street; the other figures which I have named in my answer are all found on sheet "A."

54th int. Have you examined and are you familiar with the patent specifications of William Grimman, being defendant's Exhibit H, attached to the stipulation in this cause?

Ans. I have examined the specification of William Grimman, marked Exhibit H, and am familiar with the same.

55th int. State whether or not you find the combination and invention of Nicholson, as set forth in his reissued patent and specifications, described or set forth in the said patent specifications of William Grimman.

Ans. I do not find the combination of Nicholson in the specifications of Grimman.

56 int. Have you examined and are you familiar with the patent

specifications of Richard Love, being defendant's Exhibit A, annexed to the stipulation in this cause? If yea, state whether or not you find the combination and invention of Nicholson as set forth in his reissued letters patent and specifications, described in the said patent specifications of Richard Love.

275 Ans. I have examined the specification of Richard Love, marked Exhibit A, and am familiar with the same. I do not find the combination or invention, set forth by Nicholson in his reissued letters patent, described in the specifications of Richard Love.

57th int. Look at the model here shown you, marked Complainant's Exhibit "N," and state what it illustrates.

Ans. Exhibit "N" illustrates Figure H of the drawing attached to the specifications of Thomas Wood, the younger. The blocks are of the form and arranged as shown in said figure, with the exception of half blocks to produce vertical sides. There is more difference in height between the long and short blocks than is shown in the figure; but the model is within the direction of the printed specification, where he says, refferring to the long blocks, "I sometimes make those series considerably taller, say from 1 inch to 3 inches, more or less." The model is made on a scale of 6 inches for the long blocks and three inches for the short blocks, which would make the long blocks three inches taller than the short blocks, full size. Two of the latter blocks are made of two separate peices, nailed together; that is not within the specification, but because they were made of the pyramidal form from the double-wedged blocks. The foundation and casing are made simply to hold the blocks together, and are no part of the model.

Examination-in-chief closed Thursday, October 26th, 1865, at noon.

P. A. HOYNE,
U. S. Comm'r.

276 Cross-examination of the witness, Lester D. Bond, esq'r, opened Friday morning, October 27, 1865, at 10 o'clock. Messrs. Edward Martin and Francis Adams, esquires, present as counsel on behalf of the defendant.

P. A. HOYNE,
U. S. Comm'r.

By Mr. Martin:

Cross-interrogatory No. 1. Is not your proper business that of an attorney and counsellor-at-law, and have you not been engaged in the general practice of that profession in its several branches in Chicago and elsewhere for the last several years, and how long in each place respectively?

Ans. The practice of law in its several branches is my regular business; but, as I have before stated, for the last seven years I have devoted considerable time to patent business; it will be eleven years to-morrow since I commenced the practice of law in this city. I was admitted to the bar in Ohio, but never opened an office there. I

conducted the office of my legal preceptor about six months during his absence. That is the extent of my practice elsewhere.

Cross-int. 2nd. You have stated that you have worked as an operative mechanic. Please to explain in what department of mechanical industry you have so worked; state also whether you were educated as a civil engineer, and whether you have ever practised the
277 art of road-making or the construction of street pavements.

Ans. I worked in my father's shop, commencing at the age of fifteen. He carried on quite an extensive establishment, making cooperage in the winter and cheese boxes in the summer. That was in the town of Edinburgh, county of Portage, State of Ohio. He used considerable machinery. The principal machines which I operated were the hoop and heading machines in the cheese-box factory. I have also occasionally run the saw-mill and the other machines, such as burr saws, which were in the shop. I have also laid out frames and done some carpenter's work. I never worked much in the cooper's shop, as I was away at school usually of winters. I was not educated as a civil engineer, nor have I had any practical experience in making roadways or pavements.

Cross-int. 3d. Before or during your direct examination, had you not examined and were you not familiar with the testimony or deposition of the defendant's witness, Mr. Treadwell, given in this cause; and were you not present during the whole or the greater or some and what part of the time occupied in his examination?

Ans. Before my direct examination I had examined the testimony or deposition of Mr. Treadwell, and was familiar with it. I
278 have not seen it since my direct examination commenced. I heard the principal portion of his testimony at the time it was given, as I was present nearly all of the time, except one part of a day.

4th cross-int. Have you had occasion, in any other places except Chicago, to make any critical examination of the materials used in or the methods of construction of street pavements, or was your notice of pavements in other places simply that of an ordinary observer?

Ans. I have not had occasion te examine them critically at any other place. My notice of pavements at other places was that of an ordinary observer, as I had no assistance in their examination; but I observed them with more care than I probably should if I had not been a member of the council, and interested in that subject with reference to pavements in this city.

5th cross-int. Were you familiar with the art of wooden block paving in any other method than Nicholson's before you had occasion to investigate such art for the purpose of this case?

Ans. I was not.

6th cross-int. During the time of your direct examination, had you not before you, for the purpose of reference, the several English patent specifications which you were testifying about, and
279 when you professed to make any statement or explanation with reference to the inventions or methods therein contained

or intended so to be, or to compare or contrast them with Nicholson's specifications, did you not frequently and generally post yourself from such English patent specifications as you went along in your testimony, and particularly did you not, during that time, very frequently turn to and examine the several patent specifications of Austin, Stead, Wood, Perring, and Crannis & Kemp?

Ans. I did have them before me for the purpose of reference, as I frequently desired to use the exact words found in such specifications. I hardly used them for the purpose of posting myself, as I had examined them all very thoroughly before. During that time I did very frequently turn to and examine the specifications of the parties named.

7th cross-int. Did you make no reference to or examination of such patent specifications except when you were professing to quote from them their exact words?

Ans. I do not now remember, but I presume I did.

8th cross-int. Do you not remember that one examination was postponed at the time when you could not state Crannis & Kemp's dimensions of blocks? that you examined their patent specifications for a considerable time before such postponement, without
280 being able to state their dimensions, and that it was not until the following morning that you came in and stated them?

(Question objected to as incorrectly stating as a fact that a postponement was made to enable the witness to ascertain the dimensions spoken of, the fact being that the hour of adjournment had arrived at the time of such question being put.)

Ans. I do remember that, at the time of the postponement of the examination, I was examining the specification of Crannis & Kemp, to find the height of the blocks. My recollection is distinct, that the height was given in their specification; but I was not certain that I remembered such height correctly. I therefore desired to find the words, so that I should not misrepresent them; their specifications being quite lengthy, and the dimensions not occurring in that part of the specification where I expected to find them, I therefore occupied some ten minutes in looking for them, during which time, as the hour of adjournment was near, the examination was postponed, but not at my request. I took the specification home with me, and found the words I was looking for when the postponement was had.

9th cross-int. About how much of that afternoon was occu-
281 pied by you in your explanation and comparison of the Crannis & Kemp specifications?

Ans. I was paying more attention to the answer than to the time consumed, and cannot state definitely; I should think from twenty to thirty minutes.

10 cross-int. Had you not during the whole or greater portion of that time the specifications of Crannis & Kemp in your hand, or laid open before you, and did you not frequently turn to and examine the same during such examination?

(Question objected to as being a repetition of one already answered.)

Ans. I think I had them in one or the other position all the time, and did frequently refer to them.

11th cross-int. Does Nicholson's alleged invention consist of anything else, as you understand it, than a combination of certain material substances so arranged as to form a certain wooden pavement?

Ans. Nicholson's pavement does not consist of anything else than the certain material substances arranged so as to form the certain wood pavement set forth in his specifications.

12th cross-int. When you speak of the principle of an invention and the principle of a pavement, and of a foundation, and of a block, and of a filling, and as standing in contradistinction to construction, do you use the word principle in those several instances in the same sense?

282 Ans. I do, with the exception of the principle of an invention, which is sometimes more restricted in its application than the principles of a machine, or a pavement, or a block, or a filling. The principle of an invention refers only to what is new, while the principle of a pavement refers to what may be new or old, taken altogether.

13 Cross-int. Give us, if you please, the most exact definition which you can of the word principle as applied in the two senses you have named.

Ans. The word principle, as applied to an invention, applies only to that part which is new, and means those laws of mechanics which govern the new machine or parts of machine or pavement in operation or construction; and when used in the general sense as applied to the whole payement or a completed machine containing any new invention, it means the laws or mechanical principles which govern the whole when completed in their construction and operation; with regard to pavements, blocks, and filling and foundation, I have used the word in its general sense.

14th Cross-int. Do you mean as that general sense the mechanical law which governs the construction and mode of operation of the pavement, and the several parts thereof refferred to?

Ans. I do.

283 15th Cross-int. Do you use the word scope, as applied to an invention and to a patent specification in the same sense; and define the meaning of the term scope?

Ans. I do not use them in the same sense as applied to an invention and to a patent specification. I use it as applied to an invention, to mean the objects of, and to be accomplished by, such invention; when, as applied to a patent specification, I use it to mean what is fairly within the terms, words, and drawings of such specification.

16th cross. When applied to an invention, would the term scope embrace in your meaning any shift or contrivance, which would be an appropriation of the given invention and an infringment of any patent right which might have been granted on the specification of such invention?

Ans. I think it would.

17th cross. Supppose two patentees of pavements, say A and B,

is it not possible that it might be truly said that the invention of A, as set forth and described by him in his specification, could not be found, set forth, and described in the specification of B, and yet that the invention of A might be within the scope of B's specification?

Ans. Such a thing might be possible.

284 18 cross. Define the term mechanical equivalent, as you have used it in its several applications in your testimony, or as it is applicable to a wooden pavement, or the several parts thereof.

Ans. I do not now reccollect of having used the term in the course of my examination; its application to wooden pavements is the same as its application to anything else; the term is generally used to include anything which accomplishes the same object or result by substantially the same means. (The witness here desires to make an explanation of his answer to the 17th cross-interrogatory and proceeds.) Where I stated that it might be possible for the invention of A to be within the scope of B's specification, it is to be understood that B's specification, while it did not include the particular invention mentioned by A, might from its general terms include the whole of A, in order to make B's pavement a complete one, if B required more to complete his pavement than A did, otherwise it would not be possible.

19th cross. Do you understand that oil-silk and cast-iron to be, or could, or would be mechanical equivalents for the substratum of wooden pavements?

Ans. I do not.

20th cross. Is any, and what similarity of substance, as well as similarity of use required in mechanical equivalents?

285 Ans. Similarity of substance is not a necessity in mechanical equivalents, while a substantial similarity of use would be.

21st cross. Do you profess to be familiar with the state of the art of constructing pavements, including wooden pavements, as that art existed at the time of Nicholson's alleged invention?

Ans. I do not, further than I have been informed by the exhibits in this case and Ure's Mechanical Dictionary.

22d cross. At the time of Nicholson's alleged invention, were not all the material substances which he uses in his combination used or known in the art of constructing wooden pavements, and applied to the same or similar purposes with those for which he uses them? If not, which of them was not so known or used?

Ans. At the time of Nicholson's invention all of the material substances which he uses in his combination, were known in the art of of constructing wooden pavements, as we find when we get all of the different kinds of wooden pavements together, with the exception of tarred paper, which is used by Nicholson as an equivalent for substances which were known.

23rd cross. Had not hydraulic cement, or its equivalents, and also concrete, been used in the art as a foundation upon which to place the superstructure of street pavements, for centuries before Mr. Nicholson was born?

(Question objected to as irrelevant and immaterial.)

286 Ans. The use of hydraulic cement and of concrete in the construction of streets has been known for many centuries; but whether as a foundation upon which to place a superstructure or the superstructure itself, I am unable to state.

24th cross. Was not tar at the time of Nicholson's alleged invention a usual and well-known preventive to absorption of moisture by wood, and applied for that purpose to the bottom of ships, tops and sides of houses, floors of out-buildings, and to posts and fences, and to road foundations and sidewalks and wooden block pavement, and also as a surface coating of a wooden pavement to keep out moisture from above, or to some, and which of such uses?

(Question objected to as calling for testimony which is irrelavent and improper under the issues in this cause.)

Ans. Tar was well known as a preventive to the absorption of water by wood at that time, and was applied to bottoms of ships, tops and sides of houses, out-buildings; never saw it on posts or fences; but rather for the purpose of preserving wood from rot, which would include the prevention of the absorption of moisture. I do not think it was used either for the foundation or as a surface coating of wooden pavements for that purpose; posts and fences may have been covered with tar, but I have never known of any being so covered. I find

287 in one place, to wit, in the specification of William Grimman, that asphalt, which is a mineral tar, was used as a coating to a concrete foundation, to bring it to a level, which is the only previous use which I have found in pavements on the foundation. It was also used previous to that time in filling the spaces or interstices between the blocks of wooden pavement, and for this purpose I find that other tar has been used. I have not found it used as an entire surface covering in my investigations.

25th cross. Prior to the time of Nicholson's alleged invention, was there not described in some one or more of the English patent specifications, and which you have referred to in your direct testimony, a pavement consisting of the following combinations: First, a foundation of boards and planks fulfilling the important object of supporting the blocks evenly; secondly, wooden blocks resting upon the fibre of the wood, and so arranged end to end in rows transversely across the street as to form channels or cells between the rows of blocks, with a wooden bottom to the cells, such cells being for the reception of the filling; and third, the filling of such channels or cells with broken stone or gravel, and the pouring into the same channels or cells, containing such broken stone or gravel, melted pitch or lac, and India rubber disolved in naptha or some adhesive liquid material, so as to concrete together such broken stone or gravel.

288 (Question objected to as calling for evidence of the use of the combination mentioned instead of the description, and as being irrelavant and improper under the issues in this cause; question modified and objection withdrawn.)

Ans. Prior to that time there is described in the English patent specification of Henry Austin, a pavement consisting of the combinations named in the question.

26 cross. In constructing the pavement last referred to, and substanially within the scope of the combination mentioned in the last question, might, not the blocks be of such form and size and placed in such juxtaposition on the foundation, and have such width of cells and channels between the rows of blocks as to be substantially within Nicholson's second method as to the size form and juxtaposition of his long blocks, and the width of his cells or channels between them, and might not the supposed filling of the cells or channels be substantially of the same or equivalent materials in both of such supposed instances of pavements?

Ans. I would say in constructing the pavements of Austin within the scope of his specifications, his blocks might be substantially within the size, form, and juxtaposition of Nicholson's long blocks; also the width of the channels between Nicholson's long blocks and Austin's blocks might be the same, and the filling of such channels might be within the scope of the patent, so far as regards the substances
289 of which the filling is made, be the same, although Austin mentions some substances, as sand, grit, or fibrous substances, which would not come within the Nicholson.

27 cross. Do you not find in some one, and which of such English specifications, a pavement consisting of the following combinations: First, a wooden foundation; second, a superstructure thereon of long and short blocks, so arranged as to form cells, the bottom of such cells being formed by the top of the short block; and do you not also find, and which, in some other of such English specifications the following combination: long and short blocks so arranged as to form cells, having the top of the short block for the bottom of the cell and combined with a filling of cement or concrete?

Ans. I find in the English specifcations of Crannis & Kemp a pavement consisting of a combination of a wooden foundation, a superstructure of long and short blocks, but hardly so as to form cells, as they are called grooves by Crannis & Kemp, and are only from $\frac{1}{8}$ to about $\frac{3}{4}$ of an inch in debth, the bottom of such grooves being formed by the top of the short block. I find also in the English specification of Thomas Wood, the younger, a combination of long and short blocks so arranged as to form cells, having the top of the short block for the bottom of the cell, combined with a filling of concrete.

28th cross. What is the difference between a cell and a groove
290 in the sense in which you have distinguished them in your last answer?

Ans. I understand the term cell, as used in paving, to mean a cavity to be filled with some substantial material, while a groove is a shallow indentation to make the blocks present a rough surface simply to prevent the slipping of the horses.

29 cross. If then Crannis and Kemp had happened to have made use of the term cells in their specifications for the space produced by their arrangement of long and short blocks, what would you understand by such an expression?

Ans. My understanding of such an expression would be governed by the description given of them and shown in the drawings, as such

description very frequently varies the sense in which such a word or technical term are used; calling a thing by a wrong name does not change its character.

30th cross. Is Crannis & Kemp's specification necessarily limited in terms to any particular size of long or short block, or to any particular debth of cell or groove?

Ans. I think it is so for as regards a subsequent invention, when such change introduces a new principle into the pavement.

31st cross. Will you point out, if you please, the particular places, by pages and lines of folio, in Crannis & Kemp's specification,
291 which necessarily and in terms limits their blocks to any particular dimensions, or which limits their cells or grooves to any particular depth?

Ans. On the third page, commencing with the 24th line, they say "Our invention consists in certain improved forms of blocks, or improved combination of blocks, which may be used either with or without their foundation; but all, except as hereinafter excepted, have for their especial object the affording a sure footing for horses in all weathers and under all diversities of local circumstances." On the same page, commencing on the 33d line, they say, "These blocks are placed in rows side by side, that the high and low blocks alternate in each row; the high blocks of each row are opposite the low blocks of the adjoining row, whereby a surface is produced having an equal number of raised and sunken parts, the former of which affords so many points of support to the feet of horses as well sideways as lengthways." The exception made by them in the first clause which I have noted, I understand, refers to those blocks concerning which it is stated, tenth line, fourth page, "That when worn out on one side they
292 may be turned upside down so as to present a new surface," and to figures 51 and 52, sheet A. The exact length of the short blocks is nowhere given in terms. They say on page 8, commencing with the 18th line, "We do not limit ourselves to any particular dimensions, especially in reference to the thickness of the block;" and say, "That by combining blocks of two sizes and shapes, the one shorter than the other, there is a great saving both of material and labor in comparison with the plan of cutting out grooves in the solid faces of the blocks." In line 24th, same page, they say, "Blocks of four or five inches deep, laid upon a foundation of three-inch planking, will generally be strong enough for all purposes of traffic." By saying that they do not limit themselves to any particular dimensions of blocks, I understand them to mean all of the blocks used in the pavement, and not to a further difference between the long and short blocks, as for instance blocks of four or five inches may be used in all of their modifications of pavement; they refer to the drawings, by reference to which I find that the grooves are of the same debth in all of the modifications, except perhaps those grooves that are formed by tipping the blocks alternately to one side and then the other
293 of the street, as shown in figures 20 and 21, sheet "A," which appear to be a little deeper, the debth of which is entirely regulated by the thickness and indentation of the blocks;

with this exception, the grooves are all of the same debth, whether cut in the solid faces of the blocks or formed by long and shorter blocks. I find also an expression in the second claim, page 9, line 21, where they claim "the method therein described of grooving, or placing the blocks high and low to form grooves and stops," with the exception of that represented in figures 51, 52, and 53, which do not appear to be grooved at all, which they say is "old," wherefore I conclude that shallow grooves only are within the scope of the specifications.

32d cross. Is not the reference to the plan, sheet A, figures 17, 18, and 19, expressed in the written part of the to specification be to the forms of the blocks; and is there anywhere in such written part of the specifications any specified and prescribed dimensions for the blocks in those particular figures. Please to give the specific reference only if you find it, and do not trouble yourself to give us any inferences or argumentative information?

Ans. The reference to these figures on the plan in the written or printed specification is to the form of the blocks, and does not give any specific or prescribed dimensions. The drawings, however,
294 are a part, however, of the specification, and we there find the grooves formed by the use of shorter blocks the same as the other figures.

(Obj. Last sentence of answer objected to by defendant's counsel as volunteered by the witness and not called for by the ques ion. P. A. Hoyne, U. S. Comm'r.)

Cross. 33d. If a pavement within the scope of the Austin patent were constructed, as near as you can conceive it might be to the Nicholson method, and if Nicholson's alleged invention, which I here call your attention to, in his original specifications as termed by him (a new and useful improvement in wooden pavements) should be carried out substantially on his second method, but as near as you can conceive it might be to the scope of the Austin patent, would it necessarily be any further substantial improvement upon such Austin patent in your judgment than the addition of the tarred tight-floor foundation as you have described it; the strip inserted between the blocks and the surface coating of tar upon the pavement?

Ans. If a pavement was constructed within the scope of the Austin patent as near as possible to Nicholson's second method, and Nicholson's second method constructed as near as possible to the Austin, Nicholson would not necessarily be any further substantial improvement upon the Austin pavement other than the addition of a tight tarred floor, which I mentioned as the best method of constructing Nicholson, with wood foundation or other preventive to the
295 absorption of moisture by the blocks from below and the strips inserted between the blocks, which are a very important improvement, and the surface coating of tar upon the pavement to prevent water passing down. I should also consider the avoiding the fastening of the blocks at the bottom to the foundation a material improvement in the manner of constructing the pavement as regards cheapness and expedition in laying the blocks.

Cross 34th. Would that last difference be substantial?
Ans. I think it would.

Examination of the witness, Lester D. Bond, on cross-examination, here adjourned till to-morrow, Saturday, the 28th day of October, 1865, at half-past nine a. m.

P. A. HOYNE, *U. S. Comm'r.*

Examination resumed with the witness, Lester D. Bond, on further cross-examination, Saturday morning, October 28th, 1865, at nine ½ o'clock a. m.

P. A. HOYNE, *U. S. Comm'r.*

Cross-int. 35th. You speak of Nicholson's combination and invention; do you understand his alleged invention to be limited to that combination, or does it also extend to any and which of the material substances used in the combination?

Ans. I understand his invention to be limited to the combination claimed by him; as claimed by him, I do not understand that it includes any of the materials, separately, out of which his pavement is formed.

36th cross. Does Nicholson fasten blocks to the floor?

296 Ans. He does not in terms, but in some of his variations he fastens the blocks together.

37th cross. At the time of Nicholson's alleged invention, was not a coating of tar used or well known in the art of constructing wooden pavements as a common preventive to the absorption of moisture from below by the blocks, and was not a coating of tar then also used or well known in the same art upon the surface of a wooden pavement as a preventive of moisture from above?

(Question objected to, as calling for evidence which is immaterial and improper under the issues in this cause.)

Ans. I think it was not known or used for those particular purposes.

38th cross. You have stated that Nicholson's foundation fulfils two important objects; first, supporting the blocks evenly; second, preventing the absorption of moisture by the blocks from below, and have intimated that these are the required conditions of his foundation; does Mr. Nicholson's invention, so far as his foundation is concerned, consist of certain required conditions, or does it include all material substances which will fulfil those two required conditions, or is it limited to any particular material substance; and if it is so limited, what is the name of that particular material substance?

Ans. As I understand the Nicholson foundation, it is limited,

297 so far as regards the substances used for support, to the substances named by him, but it is not limited as regards the substances used for the prevention of moisture, as, he says, "tar or any other preventive to moisture can be used for said foundation or support."

39th cross. Does not that last clause include everything which can prevent moisture from being absorbed by the blocks from below?

Ans. I think it does, although there are substances which would produce that effect which would be too expensive to be used in street pavements, if any regard to economy was had in constructing them.

40th cross. Does Nicholson's invention, so far as his foundation is concerned, consist of certain required conditions or not?

Ans. It consists of so arranging and combining the foundation that these two conditions named will be produced.

41st cross. Can you state whether that invention does or does not consist of the conditions referred to?

Ans. I think it does not consist of those conditions abstracted from everything else.

42d cross. So far as the element of preventing moisture is concerned, does it not consist of that condition abstracted from the material substances enumerated in the specification?

Ans. I think not; as I do not see how element or invention
298 can rest wholly in an abstract condition or effect.

43d cross. Suppose that Austin should claim a certain material substance for his foundation, and that Nicholson should claim the same material substance, prepared and used in the same way, for his foundation, and that the only difference between their two specifications in that particular should be a declaration on the part of Nicholson that such substance was used by him for the prevention of moisture, would that declaration of purpose merely be in itself a new and useful invention in the art of making pavements, and would it alone amount to a substantial and material difference between the two inventions?

Ans. The hypothesis named cannot be found as between the two specifications of pavements. If answered, without any regard to the specifications and two foundations, were found exactly alike in their construction, the simple naming of one effect or condition by one of them and omitted by the other, would not produce any change or effect in the character of the pavements or in the invention.

(Defendant objects to first clause of the answer, as it was not called for by the question.)

44th cross. Why is support an important object in the foundation of a wooden block pavement, and what is the nature and extent of the weight, pressure, or resistance which such support would
299 have to sustain, constructed according to Nicholson's first method; please to answer this question as approximately as you can.

Ans. It is necessary to support the blocks evenly to present as even a surface as is practicable for a carriage-way, and to prevent the blocks from being driven through the pavement, which would destroy such pavement, to prevent sinking of sections or places where the soil or substratum below happens to be less firm or compact than the surrounding or adjoining portions of the substratum or road-bed. Wagons loaded with five-ton engines frequently pass over such roadways in this city, which weight, being equally distributed upon the four wheels of the carriage, would bring a pressure of about twenty-five hundred pounds upon a single block; this would be the

same or second method of Nicholson, which makes the necessity of a foundation very apparent, particularly for the light soil of Chicago.

45th cross. What would be the effect of such pressure, particularly in the light soil of Chicago, upon the Nicholson superstructure without any solid foundation?

Ans. The long blocks would be driven down as soon as the filling was crushed, so as to very soon ruin the pavement while the filling remained intact as rammed in and concreted, the pressure would be tolerably evenly distributed between the long blocks and the concrete supported by the short blocks, but the jar of the pavement,
300 when constructed on our light soil would tend to break the joints between the filling and the long blocks, in which condition the concrete filling would be liable to be crumbled or broken, and the long blocks would settle as fast as the filling was worn or wasted away, and, in time, if the blocks all remained in position, the upper surface would be a solid wood pavement and the cells or channels formed below. I do not, however, think the blocks would remain in position long enough to produce this effect.

46th cross. In the light soil of Chicago, and with the ordinary traffic, including wagons loaded with five tons, about how long do you think Nicholson's superstructure, on his first method, would stand when the blocks were laid upon the surface of the ground without any artificial solid fuundation and support beneath them.

(Complainant's objection entered, not material, it supposing a condition of things entirely outside of Nicholson's specifications.)

Ans. I could hardly give any approximate answer to the question; I should not think it would last half the time which one would which was properly laid.

47th cross. Would it bear the pressure refferred to at all when passing over it in a waggon?

Ans. I think it would when first laid.

301 48th cross. Is there not in commerce and among mechanics a material substance known by the name of tar paper?

Ans. There is.

49 cross. Describe its width, thickness, and what it is made of?

Ans. Tar paper is used for roofing purposes; is of various widths, from two to five feet, and usually from $\frac{1}{8}$th to $\frac{1}{4}$ of an inch in thickness, sometimes not so thick as $\frac{1}{8}$th; it is made of any coarse material that paper is made of usually, of the best qualities of flax straw, and saturated with tar.

50th cross. Is the substance that you understand Mr. Nicholson refers to when he speaks in his specifications of tarred paper?

Ans. I so understand it.

51st cross. Did you ever see or hear of a piece of tar paper two inches thick?

Ans. I never did, of a single thickness.

52d cross. Could not a roadway be covered with tar paper of a single thickness only?

(Objection, as immaterial and self-evident and mode in which asked.)

Ans. If it was previously prepared with a fine concrete, or to be

laid in court yards or private ways, one thickness might do, but when required for support as well as prevention to moisture one thickness, such as I have named, would hardly be sufficient.

302 53 cross. Without reference to the object to be produced, might not a road-bed of sand, if it were smooth enough, be covered by one layer only of tar paper?

(Objected to for the same reason as last question.)

Ans. It could.

54th cross. Would the covering of the surface of the ground or road-bed with one thickness only of tar paper form practically a sufficient support for the ramming and ordinary pressure brought to bear upon Nicholson's pavement?

(Question objected to as requiring in relation to pressure and wear upon the pavement without any specification of place or condition.)

54th question withdrawn by defendant.

55th cross. In the light soil of Chicago, and for the ordinary streets, there, would the covering of the surface of the ground or road-bed with one thickness only of tar paper form practically a rufficient support for the ramming and ordinary pressure brought to bear upon Nicholson's pavement?

(Question objected to as already previously fully answered by the witness in answer to cross-interrogatory 52.)

Ans. I do not think it would; nor do I think it within the specification of Nicholson, as he nowhere specifies the quantity to be used, but does direct that his foundation shall support the blocks.

56th cross. You are aware that Mr. Nicholson, in his reis-

303 sued patent specifications says, "The earth of a roadway upon which my improved wood pavement is to be constructed must first be suitably graded in any of the usual and well known methods in order to prepare it for the reception of such pavement." And he then goes on to describe his foundation and superstructure. Now, if an English patent specification should provide and direct that the earth on which the pavement is to rest may be made to receive it by covering its surface by some sufficient preventive to moisture as tarred paper, and that the strips or short blocks may be made to rest upon the surface of the ground, would not such provision and directions in such English patent specification fulfil all the requisite conditions of Mr. Nicholson's foundation, and be substantially within the scope of his invention? and if not, why not?

Ans. I do not find any such provision or direction in any English patent specification. I understand the word pavement, as quoted in the section from Nicholson, to include the foundation and superstructure to be laid upon such graded and prepared roadway, but a direction, such ar is suppored in the question, might be within the

304 scope of the tarred paper foundation of Nicholson.

57th cross. Would it fulfil, with any of the blocks resting on the surface of the ground, all the required conditions which you have enumerated for the Nicholson foundation?

(Objected to by the complainant's counsel as not enquiring for the effect of any construction directed by Mr. Nicholson in his reissued

specifications, and not designating whether or not the blocks so spoken of in the supposed case are to rest upon the ground on the top of the tarred paper or other foundation, and as immaterial and calling for immaterial and improper evidence in this case.)

Ans. If I understood the question, it would not.

58th cross. Suppose that Austin's specification had claimed in general terms that his invention had consisted in glueing or cementing wooden blocks on to planks for wood pavements with concrete filling, and that in his specification he had said that he did not confine himself to the details of the method therein described, (and which you have already enlarged upon,) but, on the contrary, should have therein suggested that there might be other methods of effecting some of such details; and suppose a party seeking to evade Austin's patent should construct on a wooden foundation a pavement in strict accordance with his method in all its details, except in this; that

305 the compartments were not strengthened by means of ledges, glues, or otherwise secured across them underneath; and that such compartments were not required to fit into each other, and were not fastened to separate pieces of timber laid underneath, nor tied down by iron ties, would not that pavement be, in your judgment, a wooden pavement having blocks fixed on to planks or other wood, and having a concrete filling within the scope of the invention claimed as above supposed?

Ans. If we should reissue Austin's patent and amend his specification so that it should read, as suggested in the question, without any other changes in the specification—witness here refers to Austin's specification and examines it; witness resumed—or claim, I think, a pavement constructed without the ledges or stringers would be an infringement of the Austin patent, as he does not claim in his summing up these ledges or stringers to be of his invention, but he does make them a necessity in his construction; and his pavement, when constructed within his specification, must have such ledges on when constructed in compartments fitting into each other, or such compartment must be supported by stringers when they do not fit into each other, and if constructed upon Austin's method or plan in all other respects this simple omission would ruin the pavement.

(Defendant objects to last clause of answer commencing with "and his pavement as not called for by the question.")

306 59th cross. Upon the hypothesis that the Austin claim and specification was susceptible of the construction supposed in the last question, and that the parties seeking to evade that patent should not only make the omissions or changes above mentioned, but should also glue his blocks on to planks of convenient size and thickness without shaping his foundation into the particular form of compartment given in complainant's model and exhibit, or any other form of compartment, except that supplied by the natural size of the plank, and should then lay down such blocks with the blocks so glued on to them, and should strictly comply in all other respects with the description given in Austin's specification, so far as it would be applicable to the circumstances of the case supposed, would not such

pavement be a wooden pavement having blocks fixed on to planks, and with concrete filling within the scope of the Austin invention supposed in the hypothesis? Please to limit your answer to the hypothesis named in the question, and do not take the trouble to state any reasons or reasoning.

(Objection by complainant as calling for evidence irrelevant, immaterial, and improper in the case, and for mere abstract hypothetical opinion in regard to the effect of an English patent, and upon
307 a hypothesis contrary to any specification in said patent, all of which is immaterial in relation to an American invention, and outside of the issues in this case. Complainant's counsel also objects to the attempt to limit a witness in his answer to any questions of identy or of difference in principle or construction between any two inventions, supposed or described to a simple yes or no, without any liberty to give his reasons for the opinion so expressed.)

(Defendant's counsel does not wish to limit the answer to a simple yes or no; he understands the witness may state the whole of his opinion with such explanations as may be necessary in order to convey his clear and exact meaning, but he does wish the witness not to give the reason for his opinion, because such reason is not called for by the question.)

Ans. Witness refers to Austin patent. Austin says I take any suitable number of planks or slabs or pieces of wood of convenient size and thickness for this foundation, and this foundation is to be glued, cemented, keyed, pinned, or otherwise fastened together in compartments. Witness rests, and complainant's counsel further objects to the foregoing question, for the reason that it calls for the legal construction of the first and second claims set forth in
308 Austin's specification, which is immaterial in this cause, and not for the witness to make. Witness resumes, "and claims as his invention the securing of wood paving blocks on to planks or slabs or other pieces of wood, or on to stone, slate, or iron without any fastening to each other with intervals or spaces between the blocks, except at the ends where the blocks are square or oblong, as before described." As I said before, he does not claim the foundation as of his invention a compartment made of a single plank of ordinary length, while not within the description might be within the scope of the specification, if such specification was found in an American patent, nothing in this country will be intended in favor or in extension of what is actually set down as such English specification, stand in no other or higher position than an ordinary book, newspaper, article, or other publication. Taking the Austin invention as an American invention, as I understand to be supposed in the hypothesis, it would be a pavement with wooden blocks fastened on to planks with concrete filling within the scope of a patent made to read as Austin's would with the supposed words injected into it.

309 (Defendant objects to so much of the answer as commences with the word "nothing," and ends with th the word "publication," as simply enunciating a legal proposition.)

60th cross. On the hypothesis that Austin's specifications contained the positions supposed in the last two preceeding interrogato-

ries, No. 58 and 59, and that the party seeking to evade it should not only make the omissions and changes alluded to in interrogatory 58, but should also first lay down his planks of convenient size and thickness close together, on the surface of a roadway leveled for that purpose, and upon such planks should glue or cement his wooden blocks, of appropriate shape and size, and should, in all other respects, strictly comply with the Austin specifications, would such a pavement, so constructed, be, in your opinion, within the scope of the Austin invention, as supposed in the hypothesis referred to in the 58th interrogatory?

(Complainant's counsel objects to above question for the same reasons noted to the 59th interrogatory.)

Ans. If we amended the specifications of Austin by inserting artful or well chosen words every time we changed the construction or mode of construction, we can soon make it read like Nicholson's, and cover his invention. Such a change as supposed in the last question I think would be within the scope of Austin's specification, when such specification had been amended to cover it, as supposed in the hypothesis alluded to.

310

(Defendant objects to the first clause in the answer, commencing with the words "if we amended," and ending with "cover his invention," as not called for by the question.)

61st cross. Suppose the pavement to be constructed as supposed in the last question, and the foundation covered with tar, but not matched or otherwise fastened at the sides of the planks so as to prevent moisture from passing up between the joints, would such pavement be, in your judgment, within the scope of the Austin invention, as it is supposed in the last question?

(Complainant objects same as to 59th interrogatory, and objects to the supposition contrary to the fact of what is actually stated in Austin's specifications, and because his actual description is the only thing material in this cause.)

Ans. It will be observed that we have wandered some way from the actual invention, as specified by him, but in the condition in which we have supposed it, tarring the boards would be matter simply in addition, so that a pavement constructed with this addition, would in all other respects be within the supposed Austin invention.

311

(Defendant objects to first clause of answer, commencing with the words "It will be observed," and ending with "as specified by him," as not called for by the question.

62nd cross. Would such addition of tar constitute such a substantial and material difference that such pavement, without the tar, would be within, and with the tar would be without, the scope of Austin's invention, as supposed in the hypothesis?

(Complainant objects, same as to cross-interrogatory 59.)

Ans. As I stated before, the pavement with the tar would be within the scope of the supposed Austin invention, as the matter of tar would be a matter of addition, it being, however, the addition of a new substance, would be a material and, in my judgment, a patenta-

ble improvement of the Austin, as the introduction of such new substances, producing new and important effect in all respects, it would be the supposed Austin, and an infringement of it.

Examination adjourned of the witness, Lester D. Bond, till Monday morning, October the 30th, A. D. 1865, at 9½ o'clock.

P. A. HOYNE,
U. S. Comm'r.

Met pursuant to adjournment, and cross-examination of the witness, Lester D. Bond, continued, this Monday morning, October 30th, A. D. 1865, at 9½ o'clock.

P. A. HOYNE,
U. S. Com'r.

Cross-int. 63. How long has the west wing of the intersec-
312 tion of Clark and Randolph streets been paved with wooden block paving?

Ans. I think it was laid in 1863, but am not quite certain.

Cross 64. Where water can work through the foundation, does the durability and soundness of a wooden block pavement depend to any, and what, extent upon the dryness or wetness of the road bed, and of the ground in its immediate locality?

Ans. As I understand it, preserving wood would depend, in a manner, upon keeping it in either condition, as it will keep a very long time when kept perfectly dry, or kept submerged entirely in water. Rapid decay depends upon alternations between the two, wet and dry. If the ground was low, with the leaky foundation as mentioned, so that water stood all of the time in the blocks, the blocks would probably last as long as if kept as nearly dry as they can be in a street. Neither condition can be maintained perfectly in a pavement.

65th cross. Would the same pavement be as durable and sound in a comparatively wet street in Chicago, as it would in a comparatively dry one, where the foundation was leaky, as supposed?

Ans. A comparatively wet and comparatively dry street in Chicago would be about the same thing. There would not be much difference in the durability of the pavement, so far as natural
313 decay is concerned. The streets of Chicago, upon which wooden pavements are laid, are about the same in this respect, except perhaps the section of Wells street, near Wells street bridge, which is somewhat lower.

66 cross. What is the thinnest coating of coal-tar which would answer the necessary conditions of Nicholson's pavement?

(Objection to question, because it pre-supposes that there is some specific conditions in the patent with respect to the degree of thickness of such surface coating.)

Ans. The answer to this question would depend upon the experiments which I have not made or known of being made, so that I cannot tell.

67th cross. To what experiments do you allude?

Ans. To such as would test the thinnest coating of tar necessary to prevent water or moisture from penetrating the blocks.

68th cross. Do you know whether one laying of coal-tar, as it is usually applied, would be sufficient?

(Objection to question, because it assumes what is not in evidence, and not the fact, that there is a usual mode of applying the coal-tar, either in Chicago or elsewhere.)

Ans. I do not.

69th cross. Can you give no opinion on that question? If you can, please give it.

(Objected to for same reasons as last question.)

Ans. My opinion is, that as put on in Chicago, in some
314 places which I have seen, 'tis not sufficient.

70th cross. In the so-called Nicholson pavement in Chicago, is the top coating of coal-tar usually in fact more than one laying thick?

(Objected for same reasons as to No. 68, and as immaterial and improper.)

Ans. It is not.

71st cross. When you made your examination of the pavement at the intersection of Clark and Randolph streets, did you find any of the surface tar upon the surface of the blocks there, except at the edges of the sides and ends of the blocks?

(Objected to as calling for evidence of the mode in which a particular piece of paving has been laid, which is immaterial to the issues in this case.)

Ans. Where the blocks remained entire, the only indications which could be seen, except upon the bottom of the blocks, were at the sides and ends. The tops of the blocks were so filled with sand and street dirt, driven in by the use of the street, that no indication remained as to whether tar had been on them or not. When, however, the blocks were split in two, as some of them were, the discoloration of the fibre of the wood indicated that there had been tar on the top.

72 cross. Did the blocks remain entire there, anywhere except under the aprons? If so, in what part of the intersection north
315 of the railroad did you find the blocks entire, that is of the same depth as they were originally put down?

(Objected to, same reasons as last question.)

Ans. They did not remain entire anywhere except under the apron; that is, if you consider that portion which was worn away as affecting their entirety; as I used the word entire, I meant without any cutting or change made in taking them up.

73 cross. Where Nicholson uses tar in his filling, do the blocks in fact become coated with tar at the sides or ends? and if so, how do they get such coating?

Ans. They become coated at the sides and ends, except, perhaps, where the end joints are tight by the tar used in concreting the filling; if the joint between the long and short blocks and the end joint between the long blocks were made close fitting and tight, a portion

of the lower end of the sides of the long blocks and the sides of the short blocks might not be coated, but I do not understand a coating of the entire sides of the blocks to be a necessity in Nicholson pavement.

(Defendant objects to last clause of answer as not responsive to the question, commencing with "but I don't understand," and closing with "Nicholson pavement.")

74th cross. Would not a foundation of stone or slate of a proper thickness and properly cemented at the joints be some provi-
316 sion against the absorption of moisture by the blocks from below?

Ans. If properly cemented at the joints with cement prepared for water-proofing purposes it would.

75th cross. Would not a foundation of planks cemented together with a composition made of lac and India rubber and of naptha boiled together be some provision for preventing the absorption of moisture from below by wooden blocks which might be placed on such a foundation?

Ans. It would.

76 cross. In your answer to the 12th direct interrogatory, in reference to the word flooring as used in Nicholson's specifications, do you mean that the word flooring in such specifications is to be limited to that kind of floor, which, by tounging and grooving, or by lining below the joints or otherwise, would thoroughly exclude moisture from below, or would that word "flooring," as there used, also include any floor of wooden boards, whether such flooring admitted moisture to pass through it or not?

Ans. I said in my answer to the 12th direct interrogatory that the word "flooring" includes either tounging and grooving or lining below the joints, which would thoroughly exclude moisture from below the omission of such tounging and grooving or lining, while it would make a less perfect floor or foundation in respect to the pre-
317 vention of moisture, and be a somewhat imperfect method of constructing. Nicholson would not take the pavement so constructed out of the Nicholson patent, if such flooring was used in connection with tar or other preventive to moisture in the foundation.

77th cross. Would a wooden flooring of planks, without any provision for the prevention of moisture between the sides of the planks, be a flooring within your use of the term, in your answer to said 12th direct interrogatory?

Ans. In my use of the term in the answer referred to, I was giving, in this respect, the most perfect method of constructing Nicholson's foundation of wood, and that the word flooring fairly included the use of tounging and grooving, or lining, but as I stated in my last answer, the omission of these parts, and thereby leave the joints open, would be within the specifications of Nicholson, but would not as fully answer one of his required conditions in the foundation as the tounging and grooving or lining, and probably not either condition as fully as they would not support the blocks quite as evenly.

78th cross. Would a wooden foundation of boards not tarred at all,

nor prepared with any equivalent for tar, be substantially the same as or different in principle from the foundation required in the
318 construction of a pavement according to Nicholson's reissued patent specifications.

Ans. If a foundation of boards which did not have applied to them directly any tar or other preventive to moisture was laid over a roadway prepared with a hydraulic cement or tarred paper, I think the foundation would be substantially the same foundation; but if there was nowhere in such foundation any preventive to moisture I think it would be substantially different.

79th cross. Suppose the wooden foundation mentioned in the last question, without any tar thereon, or any equivalent for tar thereon or therein, should be laid upon the bare ground, would that foundation be substantially the same or substantially different in principle from the Nicholson foundation, referred to in the last question?

Ans. If I understand the words "without tar or any equivalent for tar" to mean any preventive to moisture, in my judgment, it would be substantially different in principle.

80th cross. Do you regard the existence of ledges or stringers under the foundation of a pavement constructed upon Austin's method, and the absence of such ledges or stringers under a pavement constructed upon the Nicholson method, a substantial difference in principle between the two pavements?

319 Ans. In the Austin specification we have to depend entirely upon the words, as he exhibits no drawing. As I understand the construction of his foundation, it is made of several pieces of boards fastened together into compartments. The blocks of the superstructure are then attached to such compartment so as to form large blocks made out of a number of smaller ones, which are in this condition to be laid upon the street; for convenience of construction and handling these compartments cannot be very large; ledges or stringers therefore become a necessary part of the pavement in its foundation, otherwise the compartments or large blocks formed of smaller ones would become uneven at the joints between such compartments or large blocks. These difficulties are all avoided in the Nicholson method of constructing the foundation, and seem to me to amount to a substantial difference in the principle on which the two foundations are constructed without any regard to preventives to moisture.

81st cross. Would a foundation of tarred planks laid close enough together to support the Nicholson superstructure, but being wide enough apart to permit moisture to pass up from below between the sides of the planks, it being in other respects constructed in
320 strict accordance with Nicholson's specifications B, a substantial difference in principle from a wooden foundation constructed according to the Nicholson method.

(Objected to as being a repetition of cross-interrogatory 77 and 78, previously answered.)

Ans. I think it would not; it would only be a devective method of constructing Nicholson.

82 cross. In its common acceptation in American commerce and

mechanics, is not the meaning of the term lime mortar, a mortar made with ordinary quick-lime?

(Objection to question as immaterial and irrelevant, that the mode in which the term is used in the Nicholson's patent is to be derived from its collocation and purpose, having reference to the whole patent for its meaning.)

Ans. It is.

83rd cross. Does not the term hydraulic cement in its common acceptance in American commerce and mechanics mean a cement made with water lime?

(Same objection as before.)

Ans. That is what I understand it to mean.

84th cross. Are any, and which of the wooden foundations of the so-called Nicholson pavements in Chicago tounged and grooved, or lined underneath, or otherwise constructed, so that in their construction there is any provision for the thorough prevention by such foundation of moisture being absorbed from below?

321 (Objected to as immaterial and irrelevant.)

Ans. I do not know of any which are tounged and grooved or lined, except at the end joints of the flooring, and in the respect of a thorough prevention of moisture from below, they are all, so far as my knowledge extends defective, although the attempt to exclude moisture is made in all of them.

85th cross. What attempt is made to prevent moisture passing between the edges of the boards.

Ans. I do not know of any in the Chicago pavements.

(Objection to question for same reasons made after answer.)

86th cross. Were not the boards in the foundation of the west wing at the intersection of Clark and Randolph streets, laid in the same manner as the other foundations in Chicago, that is, without any provision for the prevention of moisture passing between the edges of the blocks.

(Objection to question, same as before.)

Ans. So far, I could observe the foundation from the portion of superstructure which was taken up, I should say they were so laid.

87th cross. Did you not, in such observation find that moisture had worked up from below to such an extent that there were symptoms of dry rot on the bottom of a short block there examined by you, and did you not also find many of the blocks highly charged with

322 moisture, and is it not your opinion that such moisture or the greater portion of it had been absorbed by such blocks from below?

(Objected to as before.)

Ans. I found that moisture had penetrated the pavement, so that there were indications of rot whether wet or dry, which indications were the growth of fungous or moss on the bottom of such short blocks or strip, with a whitish appearance; I also found the blocks which we examined highly charged with moisture, but my opinion is that, owing to the heavy rains of this season and the daily sprinkling of the streets when there was no rain, that the principal portion of such moisture goes in from above.

88th cross. Is not a glue composed of lac and India rubber, boiled together with naphtha, a glue which will prevent moisture?

Ans. It is.

89th cross. May it not be fairly presumed, from the whole scope of Austin's specifications, that he does intend to use in the construction of his wooden pavements the glue referred to in the last question, or in its place any other glue sufficiently strong and not so affected by moisture or such a degree of heat as to injure the joints?

Ans. He mentions a glue constructed of those component parts, as one of the substances for concreting his filling, and also for joining his wood pavement together, and his veneers to any founda-
323 tion except wood. He says, "where wood is the foundation he prefers a glue for his flooring and other veneers, composed of one part isinglass and two parts shellac, boiled together in alcohol." The isinglass I understand to be the article known by that name, which is a fish glue, and not the mica stone, which we are in the habit of calling isinglass; this would not be a water-proof glue. He says further, "any glue sufficiently strong and not so affected by moisture or such a degree of heat as to injure the joints, would effect the object." He says also in regard to his veneers, "where there is a bedding they may be fastened by nails, screws, glue, or other suitable means, on to the floor boards or floor." His use of the glue is confined to the fastening of the boards of the compartments together, the blocks to such compartments for joining his wood pavements together and for his veneers; this use of such glue would not give his foundation a water-proof coating, nor the blocks themselves, except, perhaps, at the lower ends, and incidentally at the sides, when he used broken stone or gravel for the filling of the channels.

90th cross. Is not such glue, when hot, as thin a fluid as tar?

Ans. I presume it is.

91st cross. Do you find any direction or suggestion in the
324 reissued patent specifications of Mr. Nicholson for the use of several of his foundations combined together in the same pavement? If so, please to refer to them in terms.

Ans. I do not find any specific direction, but in his description of his flooring he says it may be covered with tar, or any other preventive to moisture can be used for such foundation or support, the object of such support or foundation being to prevent moisture from being absorbed from the ground by the wooden blocks. From which, I think, we may fairly conclude that tarred paper on boards might be used in the place of tar or on the cement foundation.

92d cross. Is it your opinion that all the foundations specified by Nicholson are intended to or may, within the scope of his specifications, be used in combination in the same foundation?

(Question objected to because it incorrectly supposes that the specifications of Nicholson call for more than one foundation, instead of various substances to be employed in the construction of the foundation described by him.)

Ans. My opinion is, that it was not so intended, but it seems to me that it would do no violence to the patent or injury to the pave-

ment to lay a cement foundation and cover that with tarred paper, and then lay on boards; I think it would still be Nicholson
325 pavement, if the foundation were laid in that manner and Nicholson's superstructure placed on it.

93 cross. Is it your opinion, from the language used by Mr. Nicholson in his reissued patent specifications, that it contains any direction whatever, or suggestion, that the several material substances described by him for his foundation, are to or may be used in combination in the foundation of the same pavement, and do you not understand it to mean that any one of those material substances in the condition in which he describes it, would be in itself a sufficient foundation for his pavement?

Ans. I do not find any direction or suggestion that they are to be used together, but I think the words "the object and effect of such support or foundation being to prevent moisture from being absorbed from the ground by the wooden blocks," are at least an intimation that they might be so used. I do, however, understand him to mean that any one of the material substances will be sufficient of itself for a foundation, taking into consideration, of course, my previous statement of my understanding that the words lime mortar, and hydraulic cement meant the same thing.

94 cross. Do you not understand Nicholson's claim to be for a combination of all the component parts of his pavement which
326 are described in his reissued patent specifications?

Ans. I do; understanding, of course, as I have just stated, that the different substances he uses for a foundation, need only one of them to be taken, and that the strips or short blocks are mechanical equivalents in the pavement.

95 cross. Has he in such specifications mentioned any material substance as a component part or element in his pavement which, or the equivalent to which, is not substantially essential to his combination?

Ans. I do not now think of any.

96 cross. Where a specification professes to describe a pavement and its method of construction, and says a given material substance may be added, for instance tar to the flooring, and describes the object and effect of such tar, do you understand that a mechanic constructing such a pavement by the specifications of Nicholson, would feel called upon to use the added substance in question, or would be in your judgment at liberty to reject it, or its equivalent, or to treat it as optional whether he would adopt it or reject it, or its equivalent?

(Question objected to, because if he has no reference to the specifications of the patent in this cause, it is immaterial and irrelevant; and if it refers to the Nicholson specifications, it incorrectly supposes that the option expressed in such specifications is an option to use or omit a prevention of moisture at all, whereas the op-
327 tion expressed in such specifications, is an option to use tar or any other preventive to moisture.)

Ans. Where the word "may" is used with regard to a compo-

nent part, and the effect of such a part stated, which effect would not be produced if such part was omitted, the word "may" would then have the effect of should or must, and a mechanic skilled in the art would not feel at liberty to omit such part, or an equivalent for such part, which would produce the described effect or result.

97th cross. Suppose some method of so coating Nicholson's blocks as to prevent their absorption of moisture from below were adopted, and such blocks were placed upon the surface of the ground, and Nicholson's superstructure constructed with them, and in their cells strictly in accordance with Nicholson's reissued patent specifications so far as such superstructure is concerned, would such pavement constructed be substantially the same as, or substantially different in, principle from the pavement of Nicholson's reissued specifications?

(Question objected to, because it incorrectly states that a pavement with the blocks placed upon the surface of the ground, without other foundation, would be strictly in accordance with Nicholson's reissued patent specifications. Question amended and objection withdrawn.)

Ans. It would be substantially different in principle.

328 98th cross. When you speak of the swaying of the blocks upon Clark street, do you mean anything more than that the foundation and superstructure have sunk with the settling of the street? If so, do you mean that the blocks have moved individually or in masses, and which, and has the motion of the individual block or the mass, as the case may be, been in one or more, and how many directions, and how far in each direction?

Ans. When I speak of the swaying of the blocks on Clark street, I mean the masses of the blocks have swayed from the straight transverse line in which they were originally laid across the street, and I give it as my opinion that the cause of this was the settling of the earth under the foundatien. In the place which I particularly mentioned, just north of Washington street, where the greatest sway occurs, the sway is all in one direction, the greatest sway being about two feet on some of the squares south of that; some of the courses are swayed both ways, so that they now stand somewhat in the form of the letter S, in their line across the street.

99th cross. What is the greatest distance in the place referred to, which any block or mass of blocks have swayed, and if a mass,

329 of what size, have swayed bodily north, and how close is such block or mass, to blocks south of it, which remain in the place where they were first laid down?

Ans. The swaying on Clark street between Washington and Randolph is nearly the entire length of the city block or square; the swaying commences about 8 feet from the curb walls and nearly the whole paving between these points is swayed at the centre or crown of the street from four to sixteen inches, and on the west side of the centre of the street near Washington, there is a piece about 8 feet wide and thirty or forty feet long, I mean lengthwise of the street, has an additional sway of eight or ten inches. The blocks next south of this and the blocks in this particular place have become inclined

from their verticul position so that there is no hole through the pavement, a part of this swaying is compensated for in the settling in the street crossings.

100th cross. Do not horses drawing heavily loaded vehicles frequently pass over and upon the west wing of the intersection on Clark and Randolph streets between the horse railroad and the apron.

Ans. I presume they do, although I never have noticed them particularly.

101st cross. Would not blocks of pine wood sink faster sat-
330 urated with coal tar than they would without.

Ans. I cannot say whether they would or would not.

102 cross. Is there not in fact some shrinkage in the blocks of the so called Nicholson pavement in Chicago.

Ans. I presume there is.

103 cross. What is the size of the gravel used in Chicago for filling?

(Objected to as immaterial and irrelevant.)

Ans. It is what is usually called coarse gravel, the size of the pebbles vary of course.

104 cross. Does it include fine gravel? I mean gravel that would pass through the 1-8 of an inch seive?

(Objection same as before.)

Ans. There may be a few pebbles in the gravel which would pass through as fine a seive, but the principal portion is much larger.

105 cross. Have you observed what substance fills the space between a displaced block and strip where the concrete remains sound at the top?

(Objected to that if the pavement is correctly constructed according to the calls of Nicholson's patent, there can be no substance except the tar, and if the defendants have constructed Nicholson pavement in a defective manner, they only are responsible for it. 105th question withdrawn.)

106 cross. Suppose from shrinkage or from any other cause
331 after the completion of Nicholson's pavement, a space say the eighth of an inch wide should be produced between Nicholson's strip and the base of his long block, what would such space be filled with?

(Objected to that the hypothesis of the question contradicts the facts in the case, that if Nicholson's pavement is correctly constructed according to the calls of his patent, there is no proof on the case that any such space would be left by shrinkage of the blocks; that if any such space should occur, it would occur by defective, construction of the pavement.)

Ans. It would either be filled with the expansion of the filling or by air.

107th cross. Do you consider Nicholson's claim to be of a pavement which before its completion and while yet imperfect, would support teams and bear public travel, or for a pavement, which when completed as he directs, will subserve certain purposes and possess certain qualities which he specifies.

Ans. I consider Nicholson's claim to be for a complete pavement, and that until the channels are filled, is not Nicholson's pavement.

108 cross. Is the picture figure one drawing number 2 annexed to complainants Exhibit B a fair illustration of the modus operandi of laying Nicholson's pavement?

Ans. Witness looks at it and says, it is as far as it goes.

332 109th cross. Is any particular width of strip described or required by Nicholson in his reissued patent specifications.

Ans. Nicholson in his reissued patent specifications says, the longer blocks are made about 8 inches in length, while the shorter blocks are formed about half the length of the others for his first method; for his second, he says, strips of board may be introduced edgewise or vertical, the width of the board being about equal to one half the length of the blocks. In further describing his second method, he says, the blocks (reffering to the long blocks of the first form) may be arranged side by side, so that we would have the same length of block, which is eight inches, and the same length of short block or width of strip, which would be about four inches. The only width described or required is about half the length of the long block, which, of course, would not be exact as he uses the word about, which would leave you at liberty to insert slips a little narrower or a little wider.

110 cross. In Nicholson's second method with 8 inch long blocks, how much wider and how much narrower might the strip be than half the length of the long block without being a substantial departure in principle from Nicholson's pavement.

Ans. There might be a variation of two inches either way

333 on eight inch blocks and still be within the patent or construction of the Nicholson pavement; if they were very much narrower, it would be an injury to the side support of the long blocks, and if very much wider, would be an injury to the filling; but if in their very narrow condition they still afforded a wooden foundation to the bottom of the cells separate and distinct from the foundation, so as to uphold the filling and prevent particles of the same from getting under the long blocks, and thereby displacing them and afforded a sufficient joint to prevent water from passing below, they would still be within the call of the specification; and if not so wide as to prevent filling the cells or channels with concrete, performing, of course, the same requirements mentioned for the narrow ones, they would still be within the patent.

Adjourned till to-morrow, Tuesday morning, at 9½ o'clock.

P. A. HOYNE, *U. S. Com'r.*

Cross-examination of the witness Lester D. Bond, resumed this Tuesday morning, October 31st, A. D. 1865, at 9½ o'clock.

Present, as on yesterday, P. A. Hoyne, U. S. Com'r.

111th interrogatory. Suppose two pavements to be constructed in all respects strictly according to Nicholson's second method with blocks 8 inches deep except in this, that one had a strip two inches

from their verticul position so that there is no hole through the pavement, a part of this swaying is compensated for in the settling in the street crossings.

100th cross. Do not horses drawing heavily loaded vehicles frequently pass over and upon the west wing of the intersection on Clark and Randolph streets between the horse railroad and the apron.

Ans. I presume they do, although I never have noticed them particularly.

101st cross. Would not blocks of pine wood sink faster sat-
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(Objected to as immaterial and irrelevant.)

Ans. It is what is usually called coarse gravel, the size of the pebbles vary of course.

104 cross. Does it include fine gravel? I mean gravel that would pass through the 1-8 of an inch seive?

(Objection same as before.)

Ans. There may be a few pebbles in the gravel which would pass through as fine a seive, but the principal portion is much larger.

105 cross. Have you observed what substance fills the space between a displaced block and strip where the concrete remains sound at the top?

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106 cross. Suppose from shrinkage or from any other cause
331 after the completion of Nicholson's pavement, a space say the eighth of an inch wide should be produced between Nicholson's strip and the base of his long block, what would such space be filled with?

(Objected to that the hypothesis of the question contradicts the facts in the case, that if Nicholson's pavement is correctly constructed according to the calls of his patent, there is no proof on the case that any such space would be left by shrinkage of the blocks; that if any such space should occur, it would occur by defective, construction of the pavement.)

Ans. It would either be filled with the expansion of the filling or by air.

107th cross. Do you consider Nicholson's claim to be of a pavement which before its completion and while yet imperfect, would support teams and bear public travel, or for a pavement, which when completed as he directs, will subserve certain purposes and possess certain qualities which he specifies.

Ans. I consider Nicholson's claim to be for a complete pavement, and that until the channels are filled, is not Nicholson's pavement.

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110 cross. In Nicholson's second method with 8 inch long blocks, how much wider and how much narrower might the strip be than half the length of the long block without being a substantial departure in principle from Nicholson's pavement.

Ans. There might be a variation of two inches either way
333 on eight inch blocks and still be within the patent or construction of the Nicholson pavement; if they were very much narrower, it would be an injury to the side support of the long blocks, and if very much wider, would be an injury to the filling; but if in their very narrow condition they still afforded a wooden foundation to the bottom of the cells separate and distinct from the foundation, so as to uphold the filling and prevent particles of the same from getting under the long blocks, and thereby displacing them and afforded a sufficient joint to prevent water from passing below, they would still be within the call of the specification; and if not so wide as to prevent filling the cells or channels with concrete, performing, of course, the same requirements mentioned for the narrow ones, they would still be within the patent.

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Present, as on yesterday, P. A. Hoyne, U. S. Com'r.

111th interrogatory. Suppose two pavements to be constructed in all respects strictly according to Nicholson's second method with blocks 8 inches deep except in this, that one had a strip two inches

wide and a cell six inches deep, and the other had a strip six inches wide and a cell two inches deep, would these pavements or either, and which of them, be subtantially the same as, or substan-
334 tially different in principle from, Nicholson's pavement.

Ans. I think they would be substantially the same in principle as Nicholson's, and both of them defective methods of constructing his pavement.

(Defendant objects to last clause of the answer as not called for by the question.)

112th cross. Suppose eight pavements to be constructed upon Nicholson's second method, having eight inch long blocks, and in strict accordance with his specifications, except in the width of the strips and the consequent relative depth of the cells, let number one have a strip one inch and three quarters in width, number two a strip one inch and a half in width, number three a strip one inch and a quarter in width, number four a strip one inch in width, number five a strip six inches and a quarter in width, number six a strip six inches and a half in width, number seven a strip six inches and three quarters in width, and number eight a strip seven inches in width, would all or any or either, and which of these several pavements, so constructed, be substantially the same as, or substantially different in principle from, Nicholson's pavement.

Ans. If the pavements were as supposed in the question in all other respects, except in the width of the strips, constructed upon Nicholson's specifications, they would still be Nicholson pavements, although the construction would be subject to infirmities and imperfect methods of constructing Nicholson's pavement.

335 113th cross. Suppose eight pavements to be constructed upon Nicholson's second method as near as may be, having eight inch long blocks, and in strict accordance with the specifications as near the circumstances of construction will permit, except in the width of the strips and the consequent relation depth of the cells, let number one have a strip three-quarters of an inch wide, number two having a striy half an inch wide, number three a strip a quarter of an inch in width, number four a strip an eighth of an inch in width, number five a strip seven inches and a quarter in width, number six a strip seven inches and a half in width, number seven a strip seven inches and three-quarters in width, and number eight having a strip seven inches and seven-eighths in width, would all, or any or either, and which of such pavements be in principle substantially the same as, or substantially different from, Nicholson's pavement?

Ans. Nicholson's superstructure requires within his claim to be made of long and short blocks forming cells or groves, the short blocks to form a wooden bottom to the cell separate and distinct from the foundation, so as to prevent gravel from working below the long blocks, and form a joint between the long and short blocks, so as to prevent water passing below. As long then as the short blocks or steps in the first four of the supposed cases performed the office assigned to them, they would be substantially within Nicholson's specifi-
336 cations, and the pavement so constructed, being of course in

other respects constructed according to Nicholson's specifications, such pavements would not differ in principle from Nicholson's pavement; if the strips were made so thin that they would perform no office at all, then I think there would be a difference in principle, a strip one-eighth of an inch in thickness, unless the pavement was constructed with very great care, would hardly perform the offices assigned to his short blocks or strips, as it could hardly be distinguished from the foundation. The last four supposed cases would hardly come within the principle of Nicholson's pavement as the claim further requires the long and short blocks or strips to be further combined with cells or channels filed with broken stone, gravel, and tar for certain purposes, among which are that the concrete in the cells or channels shall be capable of expansion under the wheels of the carriages, fill up the joints caused by the shrinkage of the blocks and prevent water from passing into the joints; as soon then as the strips are made so wide as to change the cell or channel into as simple groove, which would not hold Nicholson's concrete, the principle of the pavement would be changed; the four last mentioned would hold a concrete of broken stone or course clean gravel, in my
337 judgment, and failing to do this, a pavement so concreted would differ in principle from Nicholson's pavement.

114th cross. Each of the eight pavements referred to in the last interrogatory, (constructed upon a wooden foundation,) and strictly as stated in the question, would in fact be either nescessarily within or without the Nicholson principle; now, will you please to answer as directly as you can taking each pavement consecutively by its appropriate number, whether a pavement constructed as supposed in each of such particular instances respectively would be in principle substantially the same as or different from Nicholson's pavement?

(Question objected, to because the matters enquired of have already been fully answered in the previous answer, and because the witness having stated that in order to be within the principle of the Nicholson pavement, the strips must be of sufficient width to prevent concrete passing beneath the long blocks, &c., and also to furnish a cell of sufficient debth to hold the specified filling, and enable it to fulfil the functions assigned to it; the exact width of block which will, at the point where the pavement is to laid down, answer the objects stated is a matter of mere mechanical judgment and not of expert testimony.)

Defendant's counsel move to expunge all the objection, except the first sentence contained in the first two and a half lines, on the ground that it suggests to the witness and tends to instruct him as to the answer he shall give.

338 Ans. Numbers one, two, three and four, would be within the principle of Nicholson's pavement, provided the short blocks or strips fulfilled their required objects; it would be a matter of experiment to determine how near to nothing you could come, and still have a short block or strip. I cannot, therefore, in these four, determine without experiment whether they would be within or without the principle of Nicholson's pavement; if they perform their

required offices, the pavement so constructed would be within the principle of Nicholson's pavement; and failing to do this, would be without; with regard to the last four, it is not quite as difficult to determine. I think they would fail to form a sufficient channel to hold Nicholson's concrete for any practical purposes, and would, therefore, be without the principle of Nicholson's pavement.

115th cross. Please to state here, as explicity as you can, what the required objects of the strips in the first four supposed instances would be?

Ans. Question withdrawn, it being answered in cross-interrogatory 113th.

116th cross. How shallow a groove would hold either of Nicholson's fillings, and how deep a groove would be permitted in a pavement constructed according to Nicholson's method?

(Objected to as having been already fully answered in the three preceeding answers, and for the reasons set forth in the objections to 114th interrogatory).

339 Less than one inch in debth would hardly hold Nicholson's concrete filling for any length of time, and the short blocks or strips less than one inch in width would hardly answer fully the requirements of Nicholson's short blocks or strips, and I think a construction very near either of these limits would be defective; half strips and half filling, as Nicholson directs, are, in my opinion, the best for the pavement.

117th cross. Please to examine Nicholson's specifications and see if you can find any avowed object or purpose to be answered by pinning the blocks together? If so, state what it is.

Ans. I do find one avowed object. He says, "In order to prevent the blocks from being forced below one another in some of my modes of constructing the pavement they may be pinned together with wooden pins." I find no other avowed object.

118th cross. In constructing a wooden pavement the blocks pinned together with wooden pins, as suggested by Nicholson, and with some sufficient preventive to moisture from below, which preventive should not be sufficiently solid and strong to afford any support to the blocks, and without any solid foundation of wood or otherwise, but in all other respects strictly according to Nicholson's specifications, would such pavement, so constructed, be in principle substantially the same as, or different from, Nicholson's pavement?

(Question objected to, because it incorrectly supposes.)

(Question amended, and objection withdrawn.)

340 Ans. I think it would be substantially different for the reason that one of the required conditions of Nicholson's foundation is a support for the blocks, which condition would be wanting in a pavement of that construction. It does not appear from the specifications that the pinning together of the blocks takes the place of such supporting foundation in any instance.

119th cross. Please to examine Nicholson's specifications, and state whether you there find any specific directions for the introduction of the strip. If so, please to state what such specific directions are, giving the language of the specifications.

Ans. When speaking of his second method he says, "My invention may be carried out in another form; that is to say, as seen in figure 1 and figure 3, drawing No. 2. The long blocks may be arranged side by side and in rows transversely of the roadway, and with spaces about one inch in thickness between each two rows of them, in each of which spaces a strip of board may be introduced edgewise or vertical, the width of the board being equal to about half the length of the blocks, these boards being made to rest upon the foundation, is support resting on the surface of the ground, create with the rows of blocks long cells or grooves extending transversely across the roadway, such cells or grooves being subsequently
341 filled with broken stone, or gravel and tar, or cement."

120th cross. Do you not think that it is an improvement to nail the strips to the foundation? and do you not think that so nailing them would prevent their rising or protruding above the pavement?

(X-question objected to, because it incorrectly implies that the strips, when properly constructed in Nicholson's pavement, will rise and protrude above the pavement.)

Ans. I think, as Nicholson's pavement is constructed in Chicago, that it is an improvement to nail the strips, as they are so illy fitted to the foundation a number of those strips would have one end protruded by the process of the ramming and filling. If the strips were properly fitted to the foundation and blocks of an even thickness used in constructing the same course of blocks, I do not think such strips would work out or protrude whether nailed or not. But I think, however, nails would be of some benefit, even when the pavement was properly constructed.

121st cross. Does Nicholson, in his reissued specifications, confine himself to any particular length of strip for his second method? and does he give any directions? and if so, what, for fitting the strip to the foundation?

Ans. He does not confine himself to any length of strip in figure 1, of drawing No. 2, he shows strips about the length of the width of four blocks; in figure 3, same drawing, he shows strips of
342 the length of one block. He alludes to those figures in his description, and they are all that I find which in any manner regulate the length of the strips to be used. He does not use the word fitting, but says in his specifications, in reference to the strips, "these boards being made to rest on the foundation or support, if they rested their entire length upon such foundation they would, of necessity, fit it."

122 cross. What is the nature and extent of the advantage to be obtained by nailing the strip to the foundation?

Ans. When the strips fit the foundation the advantage of nailing them to such foundation would principally be in making the pavement a little more firm by attaching the strip directly to the foundation; where they do not fit there would be another advantage, it would prevent knocking out the filling at one end of the strip while the other was being rammed; and also in a measure prevent the same

operation of the strip in the use of the street after the pavement had been completed.

123 cross. Do you find that in constructing a pavement on Nicholson's second method, it is an essential and required condition that the strip shall rest on the foundation so as to have an equal bearing?

343 Ans. I do not know that it is absolutely essential or requisite, but it is certainly desirable.

124th cross. You have said it was desirable. Do you regard it as a requisite condition in such construction, according to the Nicholson specifications?

(Question objected to, because the words requisite condition in such construction are ambiguous, as used in such question, as not advising the witness whether, as to the point of construction enquired of, he is to answer whether the same is an essential requisite in the specifications of the combination of the patentee, or merely a requisite in the mechanical construction of such pavement, to make it fulfil correctly the purposes of the invention.)

Ans. In constructing the Nicholson pavement, with due regard to economy and rapidity of construction, absolute fitting of all points would not be essential or requisite; all that would be required in such construction of the pavement would be, that they should so far fit the foundation as not to be moved in ramming the filling, or in the subsequent use of the street.

125th cross. Do you regard the fitting named by you in the last clause of your preceding answer a requisite condition of the specifications in question?

(Question objected to for same reasons as last question)

344 Ans. I regard it as a requisite condition to a proper construction of the pavement, but a pavement constructed without this substantial filling of the strips to the foundation would be within the specification.

126th cross. Does the Nicholson pavement, properly constructed, permit water to get down through the concrete?

Ans. When properly constructed with sufficient tar or cement to form, with the broken stone or gravel, a solid body, water would not get down through the concrete.

127th cross. Would a concrete filling, which permitted water to pass down through it, be a filling within the call of Nicholson's specifications.

(X-question objected to, that it calls for evidence immaterial and improper for the reasons stated in the objections to 124th interrogatory, for the reason that the question leaves it ambiguous, whether it refers to such filling bring a requisite to the correct construction of the pavement as described, or whether that such filling should be perfect is a requirement of [of] the combination itself.)

Ans. Nicholson's specifications calls for a filling, which, when pressed down, will be made to spread latterally on the short blocks, and thereby completely close up the joints between the blocks

345 and the filling, so as to prevent water from passing down

into the joints between the blocks, the exclusion of the moisture from the blocks themselves is, by the materials employed, for the support of the blocks by the preventives, and by the tarry covering which is placed over the top surface. In the claim he calls for such cells or channels and filling as will prevent water passing from the surface of the pavement downwards through the joints of the wooden blocks. The preventive qualities of the filling within the specification seems to be to close the joints between the blocks; if therefore water got into the filling itself, such filling would still be within the call of the specifications. If such filling permitted water to flow through it into the joints at all times and at all places, it would not be within the call. In constructing Nicholson's or any other pavement used for the upholding of heavily loaded teams, it would be extremly difficult, if not absolutely impossible, to so fill the channels that water would not pass down some points or places in such pavement. I do not consider the Nicholson specifiations to call for an impossibility; I therefore think that a filling which would to a considerable extent prevent water from passing down through
346 the pavement would be within the call of the specifications, although not perfect in its operations.

128th cross. Do not Nicholson's specifications, as you have explained them in your direct testimony, contemplate that water will get to the top of the strip or short block in his pavement?

Ans. I think not.

129th cross. What depth of filling, composed of gravel and coal tar, in the proportions contemplated by Nicholson's specifications, would be sufficient after the pavement had been laid down, say two years, to protect the top of the strip from moisture reaching it from above?

Ans. That is a difficult question to answer, as some woods will wear faster than others. I have never made any examination or test as to the durability of a pavement, but if I recollect right $\frac{3}{16}$ of one-inch is considered the usual wear of pine blocks per annum, unless, therefore, the filling was over an inch in depth; originally there, would not be much filling left at the end of two years.

130th cross. Does common salt preserve wood by preventing absorption of mosture by such wood?

Ans. It does not.

131st cross. Does not concrete mean a compound body
347 made up of different materials; and would not a grant of flint-stones, compounded with a proper adhesive liquid, make a concrete filling within the call of Nicholson's specifications?

Ans. That is what the word concrete means in its general sense. A concrete of flint-stones, with a proper adhesive liquid, would make a filling within the call of Nicholson's specification.

132 cross. If the flint-stones were broken down into small pieces or pulverized, would it make any substantial difference as to its being an element in such concrete; that is, would the concrete of flint, broken down or pulverized, as supposed, when properly compounded with the adhesive liquid, be substantially within Nicholson's concrete, as called for by his specications?

(X-question objected to, for the reason that it is ambiguous and uncertain in placing. Objection withdrawn.)

Ans. If the flint-stones were broken down into small pieces they would be within the call of the specifications; as Nicholson says, "these cells are to be filled up with small broken stone or coarse clean gravel." If they were pulverized, so as to form simply flint-sand or grit, the fineness of the filling would prevent a proper concreting, as Nicholson directs the filling to be put in and rammed before the tar or other liquid cement is poured in; such pulverized flint would, therefore, hardly come within the cells of the specifications for a concrete; if, however, the pavement, in all other respects, was constructed on Nicholson's method or plan, and such grit concrete filled into the cells with its whole mass permeated with tar or other suitable cement, so as to fulfil the conditions of Nicholson's concrete, I think it would still be Nicholson's pavement.

348

133 cross. How could such concrete, containing pulverized flint, be filled in, so as to fulfil the conditions you last referred to.

Ans. It could not well be done by following, in detail, the directions for constructing the pavement as given by Nicholson; but if such grit was concreted with proper adhesive cement, so that it would subsequently harden and retain a slight elasticity, and in such prepared condition be rammed into the cells or channels; when filled in this manner it would answer the required conditions of Nicholson's filling, in some respects perhaps imperfectly.

13th cross. Would such a pavement be substantially different in principle from the Nicholson pavement if the concrete referred to in your last answer should not be rammed, the pavement being in all other respects in strict conformity with Nicholson's specifications, except the method of filling and ramming the concrete?

349

Ans. Ramming is simply a matter of detail in the construction of the pavement; when applied to broken stone or coarse gravel, it has the effect to solidify or compact the particles of the filling more closely together, and in this respect is an advantage. The necessity for it would be less in a fine concrete, and rammed or not rammed, would not effect the principle of the pavement.

135th cross. Would a pavement, constructed strictly on the Austin method, as you understand it, except that the hard or fibrous filling, if any, should not be cut up into small pieces, but should be cemented, as far as might be in the joints, if any, with an appropriate cement or adhesive liquid, be, in principle, substantially the same as, or different from, the Austin pavement.

(X-question objected to as calling for irrelavant testimony, the question being not what can be made out of the Austin specifications by different changes and modifications, but what is described in such specifications.)

Ans. It is difficult for me to tell what Mr. Austin means by hard or fibrous substances, particularly the fibrous, which would be mechanical equivalents in a pavement when cemented or concreted together for stone, slate, grit, gravel, or sand.

350

He says the filling in is to be cemented or concreted together. He says nothing about cementing or concreting his filling to the blocks, so that I do not think a filling of wood or old rope, without being cut up, come within the specifications of Austin, as in that condition it would be impossible to cement or concrete them together the wood being already a solid substance, and the old rope so compactly twisted that it could only receive a coating. I think, as I have before stated, that strips of wood, old rope, similar material, not cut up, cannot justly be termed filling. If not, there would be a difference in principle between a pavement constructed in this manner and the one described by Austin. Austin specifies in his first form of pavement that the blocks are to be fastened to the foundation without any fastening or connection together of the blocks and with intervals or spaces between them of about an inch and a half to the entire debth of the blocks, and directs the same filling to be used for both of his forms. Strips of wood being evidently an improper filling for the first form of his pavement, could not properly be intended for the second, as he only gives one direction concerning the filling for both of his forms of pavement.

136th cross. Having reference to the directions given by Austin would it not be a matter of mechanical judgment in constructing his wooden pavement to determine the length of the blocks, and the consequent depth of the cells and the nature of the filling, whether
351 with broken stone, refuse or broken slate, gravel, or any other hard or fibrous substances and the cementing or concreting thereof, together with appropriate adhesive liquid material, named by him, depending on the location and the probable prospective use of his pavement.

(Question objected to for same reasons as to cross-interrogatory 138th.)

Ans. The determining the length of the blocks, and the consequent depth of the channels is a matter of mechanical skill, as such lengths are nowhere given. He says but little about his pavement, as the major part of the specifications is on foundation and veneers. He says, however, in speaking of his pavement-floorings and veneers, that he has described the methods which, in his apprehension, are the most simple, though it must be evident that there other ways of effecting some of the details pointed out. His claims are first for glueing or cementing of wood, cut, &c., on to plank, or slabs, or other pieces of wood, or on to stone, slate, or iron, for wood pavements, and in addition to these cement and title, for the purposes of veneers. He claims, second, the securing of wood paving blocks (which would include nailing) on to planks, slabs, or other peices of wood, stone, slate, or iron, without any fastening to each other as in his first form and with intervals or spaces, except at the ends, as in his second form; third, the application of veneers, as described, to flooring and other building purposes. If we were in England, and constructing
352 pavements on the Austin patent, these two points first named in the claim would be the only ones to which we would be

required to pay any attention; the other details would be left entirely to our judgment in the length of the blocks and consequent debth of the cells in the substances used and manner of using them for concreting in the construction of our foundation, and in all the details, except those named in the first two claims; when using the specifications here to defeat an American patent, we are not at liberty to go outside of what is actually set down in the specifications, whether such things are claimed or not.

137th cross. In giving your views at length on the Austin specifications in your direct examination, by which of those rules did you construe them, by the English rule of interpretation or by the American rule of interpretation?

Ans. I construed it by the American rule so as to give to the American public what I consider to be fairly within the terms of Austin's specifications.

138th cross. In the construction of Nicholson's pavement within your experience in Chicago, does not the filling and pouring in of the tar precede the ramming? and if so, does not the ramming compact the concrete into a smaller space than it occupied before, and how much smaller?

(Question objected to as asking for the consequences of a mode of construction of the pavement contrary to that set forth in the
353 specifications, and a departure from the details described by Nicholson, for which he is in no way responsible.)

Ans. As I have seen the Nicholson pavement constructed in this city, tar has been poured into the filling before the ramming. This is, however, contrary to the directions of Nicholson, and the ramming settled the filling about half an inch.

139th cross. Has not the intersection of Washington and Clark streets been laid long enough to test the durability of Nicholson's first method of paving?

Ans. It has been laid hardly long enough for a test, but if the paving of that street had been properly done, a tolerable judgment of its probable durability could be made.

140th cross. In speaking of the durability, and the tendency to, of the blocks to tip up and get displaced in the Austin pavement, did you speak of your own personal exeperience of the actual wear of such pavement, or not?

Ans. I did not speak from any experience, as I never saw any Austin pavement, unless it should be the twelve courses of blocks, sixteen feet in length, which are firmly surrounded by the Nicholson pavement and stand on a Nicholson foundation at the intersection of Clark and Randolph streets, should be called Austin pavement.

141st cross. Were not the blocks in the twelve courses last referred to toe-nailed to the foundation, so far as you observed them?

Ans. My recollection is that they were. I did not observe
354 every block particularly.

142 cross. Did you, in that twelve courses of blocks, find or observe a single block, which was tipped up, loosened, or displaced, or had a single toe-nail drawn or started, except so far as the blocks

were intentionally displaced at the time for the purpose of the investigation?

Ans. I did not.

143 cross. Is there anything in the proximity to a curb-wall, which prevents the toe-nailing of an Austin block at the sides?

Ans. Nothing.

Adjourn till to-morrow, being the first day of November, A. D. 1865, at 9½ o'clock a. m.

P. A. HOYNE, *U. S. Com'r.*

Met pursuant to adjournment on yesterday, and cross-examination of the witness, Lester D. Bond, proceeded with this Wednesday morning, November 1st, A. D. 1865, at 9½ o'clock.

P. A. HOYNE, *U. S. Com'r.*

144th cross-interrogatory. Do the drawings annexed to the specifications of David Stead, Thomas Wood, the younger, and Crannis, and Kemp, purport either upon the face of the drawings themselves or in the written part of the specifications to be made to any particular scale?

Ans. My recollection is that Stead and Wood do not, and that Crannis and Kemp virtually do in their written specifications, where they say "a foundation of three-inch planking, as aforesaid, with blocks four or five inches deep laid upon it, will generally be
355 strong enough for all purposes of traffic, which would give about eight inches of wood to the pavement; the variation being only one inch, would indicate pretty accurately the scale of the drawing.

145th cross. Do you not know that prior to the enrollment of Stead's specification, that is, namely, August 23, 1839, foundation of hydraulic cement asphaltum, and also artifical compound substances, being preventives to moisture, had been used, and were then well known as expedients for making hard roadways or paths, and also as foundations for pavements and other superstructures?

(Question objected to as immaterial, and calling for evidence which is irrelevant and improper under the issues in this cause.)

Ans. Such substances were known and used prior to that time for some of the purposes mentioned, but whether they were ever used as a foundation for street pavements, which had a superstructure placed over such concrete, I do not know.

146th cross. Do you not know that they were used as the surface of a roadway without any particular superstructure placed upon them?

(Objected for the same reasons as last interrogatory.)

Ans. The ancent Romans used concrete in the construction of their roads, but, as I have before stated, I do not know how they used them.

147th cross. In reference to figures 18 and 19 of Stead's plans, of which complainant's Exhibit L is produced as a model, do you not find in Stead's specifications that after providing for a pavement of

octangular blocks, if, with a square recess into which may be
356 filled a corresponding peice, (m,) he reccommends that when such octangular blocks are laid upon a newly-laid embankment or shrinking base, a pile may be driven into the earth through the square recess or interval of about the size of the dotted lines, figure 19, of his plan, in order to support the blocks.

Ans. I do find that in his specifications. He, however, in his specification, says the foundation "is first suitably prepared to the required figure by the usual well known means to receive such wooden blocks, which are so disposed as to present an even uniform surface," which are all of the directions or specifications he gives concerning his foundation, except what is stated in reference to the plan shown in figures 18 and 19, where he says "if the embankment is newly made, or of a shrinking base, he recommends the use of piles;" the only difference between this and his other foundation, to my mind, is that the one is new or recently made, and the other well-settled. In other respects I understand them to be exactly alike.

148th cross. Do you find any directions or particular mention of such pile in his specifications, except the reference contained in the last question.

Ans. I understand the reference in the last question to be
357 to the form shown in figures 18 and 19; to other than that form I do not find any.

149th cross. Does not Stead also direct or suggest the laying of a lower series of blocks as a support for the superstructure of the upper series of blocks, and the filling where fillling is used?

Ans. Stead suggests in the form shown by him at figures 10 and 11, and also at figures 12 and 13, the laying of a lower course of the same form of blocks, about one-third the length of the other blocks for the purpose of supporting an upper layer, but in these two forms as shown, there are no interstices between the blocks to be filled, nor any mention of any filling, or of supporting any filling, and these two forms make it further evident that there was no concrete or support used in his original preparation of the roadway, as in that event such laying of a substratum of shorter blocks would be wholly unnecessary, the only office which the lower course of shorter blocks seems to fulfil is the breaking of the joints of the upper blocks, so as in effect to give them a broader base to rest upon the earth of the roadway.

150th cross. Do you understand that such upper blocks are limited to any particular form by the specifications.

Ans. In the form shown at figures 10 and 11, he speaks of the lower blocks, and calls them the lower hexagons, and does not mention change or different form for that plan. In the plan shown
358. at figures 12 and 13 he says: "The lower course is formed of triangular blocks," which would be half blocks of the other form; he has mentioned no other form of blocks to be used in constructing a substratum of shorter blocks, and for one purpose I think they are limited to these two forms as no others are mentioned or suggested; for general purposes they would not be so limited.

151st cross. What do mean by the use of the terms "our purposes" and "general purposes," in the connection in which you have used them in your last answer?

Ans. By our purposes I mean our investigations as to whether the Nicolson invention is found described in the said specifications. This I understand to be what we are now considering, and for this purpose I understand we are limited to what is actually set forth in Stead's specifications, or fairly included in the terms used by him as I have before stated. By "general purposes" I mean if we were constructing the Stead pavement without regard to anything else I should not consider that we were so limited.

152 cross. Suppose that grooves wide enough and deep enough to to hold the filling, as mentioned by Stead in some of his forms, were made in the upper surface of the upper series of blocks standing upon the lower series as the standing of such blocks is contemplated by Stead, and that the pavement was, in all other respects,
359 strictly in accordance with Stead's specifications, would a pavement constructed as above, supposed to be in principle substantially the some as or substantially different from Stead's pavement.

(Question objected to as immaterial, improper, for the reason that the issue being in this cause, not what can be made out of Stead's invention, but what is described in his specifications. Defendant moves to expunge the last clause of the objection as being a repetition of first, with an instruction added or intimation to the witness.)

Ans. I think it would be still Stead's pavement and not amount to a difference in principle.

153 cross. Do you not find that a substantial foundation of some kind or other is a necessary condition upon which to construct Wood's superstructure, or do you understand that he intends or intimates that his pavement can be constructed without standing upon anything?

Ans. I do not find a substantial foundation to be a necessary condition in the construction of Wood's pavement, as I find him mentioning as one of the advantages of his pavement, that the form of the blocks will give the pavement a complete firmness and solidity on any kind of a foundation of mere shingle, gravel, or sand. I do not understand that he intends or intimates that it can be constructed without standing upon anything, because some kind of a foun-
360 dation of earth, sand, or gravel will be necessary for all pavements.

154th cross. Do you understand Wood to limit this pavement to a foundation of shingle, gravel, or sand, and do you understand that Wood's superstructure placed upon any of the foundations for artificial pavements which were then commonly used and well known in the art of constructing pavements would be a substantial difference in principle from Wood's pavement.

(Question objected to for same reasons as objections to interrogatory 151st.)

Ans. I do not understand Wood to limit himself to the three sub-

stances mentioned in his specification, as he says "even when" laid over these. But I do understand him to mean that any kind of an indifferent foundation will be sufficient, as he says nothing about foundation except in this manner, and by the terms of his specification, relies upon the form of the blocks for the firmness and solidity of his pavement. I do not understand that if Wood's pavement was laid upon a solid foundation it would change the principle of it, as the principles of his pavement are entirely in the superstructure.

155th cross. Which wears away fastest in Nicholson's pavement, second method, the concrete or the wooden blocks?

361 Ans. When the pavement is first constructed, the horse-shoes cut out a portion of the concrete filling, after that they remain in about the same relative position. The concrete a little lower than the blocks during the existence of the pavement. The concrete being from a quarter to half an inch lower than the blocks.

156th cross. Suppose the channels or grooves in Steads pavement to be entirely filled with cement instead of leaving a slight space unfilled beneath the top surface, would you consider that such filling was a substantial departure in principle from Stead's pavement?

Ans. That would depend upon the kind of cement used; if filled with a cement of iron fillings which is one of the cements known in the art, or any other cement which would become harder than the wood, or as hard, or equally as hard, it would be a substantial departure from the principle of Stead's pavement, as it would defeat the object of making such groove, as he directs that a slight space shall be left unfilled to afford the hole to the horses feet. If filled evenly to the top with such cement as would soon wear away as to leave the required hold for the horses feet, it would not be a substantial departure in principle.

157th cross. Would the filling of iron fillings referred to by you be a filling within the call and requirements of Stead's specifications?

362 Ans. In constructing his pavement such cement would hardly be used, yet it would be as fairly within the terms as old rope or cotton would be in Austin's.

158 cross. Would not a cement which would prevent moisture passing through it, and fullfil all the purposes for which Stead uses it, be fairly within the term cement, used in reference to his filling in his specifications?

Ans. It would, as a large number of the cements known in the arts have that quality.

159th cross. Do you find in Stead's written specifications any limit to the depth of his cells?

Ans. I do not, except as we are referred to the figure of the drawings by the written specifications.

160th cross. Suppose a pavement to be constructed strictly in accordance with Stead's plan, as shown in figures 21 and 22, except in this, that the grooves were cut on two opposite sides only of the blocks instead of on four sides, and that the ends of the blocks without grooves should be placed close together, so as to prevent the appearance of alternate rows of blocks, and alternate unbroken

channels between them, would such a pavement so constructed be in principle substantially the same as, or substantially different from, Stead's pavement?

(Question objected to, for the same reasons as given to cross-
363 interrogatory, 152.)

Ans. I do not know that it would change the principle of the pavement, but it would by constructing a pavement such as Stead nowhere directs.

161st cross. May not Crannis & Kemps long blocks and Austin's blocks be substantially in form the same as Nicholson's?

Ans. They may.

162d cross. Please to examine the block of wood, defendants Exhibit "A" to your deposition, and state whether or not, a pavement constructed with such blocks, for the long blocks, and in all respects, strictly, according to the specifications of Nicholson's second method, would be a pavement in principle, substantially the same as, or substantially in principle different from, Nicholson's pavement?

Ans. I think it would in principle be substantially the same. It would however make a defective construction, as it would leave open joints between the blocks, unless the ends were reversed each time the blocks were laid, and if so reversed would leave an irregular line for the strip, so as to form an open joint between the block and strip.

163d cross. How wide would that joint be?

Ans. Between two six-inch blocks. If both were laid with the wide ends upwards, they would be at the bottom half an inch apart,
364 saving perhaps a slight compensation found in the crown of the street; if laid the other way, the joint would be the same at the upper end, with the addition of the difference made by the crown of the street; if laid alternately, the joints would be closed.

164 cross. Will you give us, if you please, the dimensions of such block, including its height, its thickness at the top and the bottom, and its thickness at top and bottom at each end?

Ans. It is six inches high, and at one end four and a half wide; two inches and seven-eights thick; at the other end it is four inches wide and three inches and a quarter thick. (The witness desires to add to his answer to interrogatory number 163, and proceeds.) This would be as between the blocks themselves as between the blocks and the strips; the strips in Nicholson being placed vertical would only touch the blocks at the bottom, which were widest at the base, and there wouldbe a space at the bottom of three eights of an inch between the strip and those blocks which were reversed, and at the upper edge of thestrip would leave a space of $\frac{3}{16}$ of an inch between the strip and all of the blocks.

165th cross. If Wood's alternate blocks of pyrmads stood close together and double wedged, as in figure F, in plan annexed to
365 his specifications, would not surface pressure on any part of row of blocks have a tendency to wedge them together.

Ans. It would not; pressure only on the blocks marked block "A," in the row figure "F," would have that effect.

166th cross. Are not the rows of long blocks in figure "K" designed to show the same arrangment as the blocks in figure F, so the same arrangement of rows of blocks?

Ans. They are not; they are the other end up in K, of what they are in F.

167th cross. Does not figure K represent alternate rows of long and short blocks, having cells or channels in rows between such rows of blocks, the bottom of the cell being formed by the top of the short block?

Ans. It does.

168th cross. What is the proportion which the surface of wood in figure K would bear to the surface of concrete, assuming the channel to be filled with concrete?

Ans. The proportion of wood would be about $\frac{3}{5}$ths and of the channel about $\frac{2}{5}$ths at the top of the pavement.

169th cross. Do you find any specific directions in Wood's specifications for cuting his blocks all the same size? Do you not find that he provides for four sizes of blocks, some taller, some shorter, some wider, some narrower than others.

Ans. I do not find any specific directions for cutting the
366 blocks all of the same size; but I do find, from the construction of the pavement, that it is absolutely necessary to cut the blocks used in the same pavement all of one size, except as to length, to make any pavement at all. In his specifications he speaks of some half blocks, which are to be used to break joints. In constructing a pavement I mean the blocks should all be of the same size which are in the same course; the width of the course, by the use of different sized blocks, can be changed in the same pavement.

170th cross. Cannot the course of the lower blocks be made narrower at their base than the base of the blocks used in the tall rows? and if the top of the short blocks should be wide enough to seperate the rows of long blocks, so as to leave a space of an inch and a half between such rows of long blocks, and if the width of such short blocks at the base were wide enough, only to give the required angle to the sides, and so as to produce the top width aforesaid, for such short block, and such short block, was half the depth of the long one, would not a pavement so constructed be substantially the same in principle as Wood's pavement, provided that it were in all other respects the same as Wood's specifications.

Ans. The lower blocks can be made narrower at their base than the taller ones; and if so made as to reduce the course of short blocks
to an inch and a half in width it would not change the prin-
367 ciple of the pavement.

171st cross. Might not the lateral dimensions of the short blocks, crosswise of the street, be considerably larger than the lateral dimensions of the long blocks in the same direction, and still be within the principles of the pavement? and if so how much larger?

Ans. Wood says the blocks I use for paving are of two forms, the section of the pyramid, having either a square base or an elongated base, and the double-wedge, cut from either a similiar square base or a

similiar elongated base; such changes, therefore, would not only be within the principle of the pavement, but within the letter of the specification. The forms shown by him at figures B and D, as representing his blocks with elongated base, shows a difference of about one eighth the lateral dimensions of the block. It would be difficult to state how far this could be carried, for if carried to a great extent it would negative the wedge principle of the pavement.

172d cross. Please to examine the model marked defendant's Exhibit "B," of this your deposition; observe that it contains three modifications of the short blocks, one of them having the fibre horizontal with the base, and state whether any, or either, and which of three pavements constructed one upon each of such arrangement, respectively, with such forms of long and short blocks, respectively,

368 all of the blocks (being of course of an appropriate size for a street pavement) would, if constructed in all other respects in strict accordance with Wood's specifications, be in principle substantially the same as, or substantially different from, Wood's pavement.

(Question objected to as to imateriallity.)

Ans. The first form, marked section one, on the model is very near figure K of Wood's specifications. Section 2 has the arrangement of Wood's blocks, and these two are substantially Wood. Section three seems to me to be changed from the principle of Wood's pavement, as Wood in his specifications says, (commencing on line 27, page 2,) "a number of such alternate series of blocks being placed across a road, all the blocks are made to lean and press on each other on all sides in natural support." The short blocks in this section there seem to be too far elongated to produce this effect, and in that respect seem to differ from Wood's pavement. It seems to me a block five times as long as it was wide, although its sides were all sloped or inclined from the vertical line, would hardly be called a pyramid, nor a block of the same dimensions having its sides sloped one way and its end the other, a double wedge. I do not know that the fact of their being laid with the fibre of the wood horizontal makes any difference, as there is nothing said as to how they are to be laid in that respect;

369 but from the forms showed in his figures, and from his statement, that they may be made of stone, wood, or any other substance or material suitable for paving, I think a fair construction of his blocks with an elongated base would not make them much wider one way than they are the other, one-third the distance being the difference which he has shown for his elongated blocks in the drawings. This will be the more readily appreciated when we consider the primary design of Wood was for a stone pavement. I mean by one-third, the distance that his elongated blocks are $\frac{1}{3}$ longer at the base than they are wide.

173d cross. Is it not a mechanical principle that pressure upon a wedge exerts itself at the points of friction or contact in the first instance in a certain given, and what, angle with the line of the pressure?

Ans. It is a principle of mechanics that the pressure upon a wedge

exerts itself at the point of contact in the first instance; the angle depends upon the form of the wedge.

174th cross. What angle does the direction of such force form with the wedge?

Ans. A right angle with the face of the wedge.

175th cross. Are not the sides of the blocks which bound the cells in Nicholson's first method liable to become shattered and exfoliated by the action of horses feet and other causes?

Ans. They are to a limited extent.

176th cross. How do they compare with Nicholson's second method in this particular?

370 Ans. I think they are a little more liable to become exfoliated in the first form than they are in the second.

177th cross. Suppose the top of Nicholson's block, second method, should overhang the point of contact with a short block only $\frac{1}{8}$ of an inch, would such overhanging produce any serious increase in the exfoliation?

Ans. It would to the extent of the overhanging, for the reason that the blocks being placed with the fibre vertical the overhanging part would be liable to become detached and in that respect would be worse.

178th cross. Suppose the overhanging proceed at a regular slope from the point of contact and should be at the top of the block only $\frac{1}{8}$ of an inch out of the perpendicular and overhanging such point of contact, would it in that particular present such serious obstacles as that a pavement so constructed, but in all other respects in strict accordance with Nicholson's specifications, would it be different in principle from Nicholson pavement.

Ans. I don't know that a pavement so constructed would be different in principle; it would be an expensive block to use, as each block would require to be separately prepared, which would make it expensive.

179th cross. Please to state whether defendant's Exhibit "A" to your deposition does not represent a double wedge block, cut at an angle not exceeding 88 degrees.

Ans. I have no means present of testing the exact angle of the block; I should not think it exceeded that angle, and is a double wedged block.

Re-examination of the witness Lester D. Bond on behalf of

371 the complainant.

P. A. HOYNE, *U. S. Comm'r.*

Direct examination resumed.

With direct interrogatory No. 58:

In the 33d cross-interrogatory you are asked as to certain differences between the Austin and Nicholson pavements, when constructed, as in the question supposed. Please state from what point of time in relation to the completion of the pavement you answered the question; and also, whether or not there is any substantial improvement

in the Nicholson pavement over the Austin pavement in the manner and mode of construction; and, if so, what it is.

Ans. The point of time was when the two pavements were fully completed, as was supposed in the question. There are several substantial improvements in the manner or mode of constructing the Nicholson pavement over the Austin. One of them I named in my answer to that interrogatory, which was avoiding fastening of the blocks to the foundation; the others are in discarding the compartments and the ledges or stringes of Austin. The others have been previously stated in my direct examination; I don't remember what.

59th direct. In your answer to the 74th cross-interrogatory you have stated that a foundation of stone or slate properly cemented at the joints would be some provision against the absorption of moisture by the blocks from below. Please state to what you refer;
372 and also what would be the effect of such foundation of slate or stone in reference to the condensation and retention of moisture on the slate or stone itself and at the bottom of the blocks.

Ans. I referred to the prevention of moisture or water from percolating up through the foundation of slate or stone between the joints of such foundation. The stone or slate being imbedded in the earth would condense a portion at least of whatever moisture came in contact with them in the form of vapor as they would be cooler in hot weather than their surface surroundings. Whatever moisture or water came in contact with such blocks of stone or slate, in coming down through the pavement, would be held by them at the bottom of the blocks.

60th direct. State whether or not the foundation supposed in cross-interrogatory 75th would be the foundation described by Nicholson; and if not, in what respect the foundation specially described by Nicholson would be a change, and whether or not such change is one of principle as an improvement.

(Defendant objects to the last clause of this question as leading, and also as calling for testimony which is not rebutting.)

Ans. It would not be the foundation described by Nicholson, as there is in such supposed foundation no preservative of the foundation itself other than at the joints as there is in Nicholson, and a cementing together of the boards which is not in Nicholson. I think such change would amount to a change of principle as an im-
373 provement as one of the difficulties of constructing the supposed foundation would be avoided.

Re-direct examination of the witness, Lester D. Bond, on behalf of complainant was here adjourned till to-morrow, Thursday, November 2d, A. D. 1865, at 9½ o'clock a. m.

P. A. HOYNE, *U. S. Com'r.*

Met pursuant to adjournment on this Thursday morning, November 2d, A. D. 1865.

P. A. HOYNE, *U. S. Com'r.*

61st direct int. Do you know whether or not the strip referred to in your answer to the 87th cross-interrogatory was sound when it

was laid, or whether the plank or boards below it had a loose or open joint?

Ans. I do not know whether it was sound when it was laid as I never saw it to notice it till it was in Mr. Martin's hand, so that I cannot tell whether it had been laid in proximity to a crack in the flooring or not.

62d int. In your answer to the 94 and 95th cross-interrogatorys you have said that you regard Nicholson's claim to be for a combination of all the component parts of his combination which are described in his reissued patent specifications, and also that you don't think of any material substance as a component part or element in his pavement which, or the equivalent to which, is not substantially essential to his combination. Please state what you understand to be that combination, and what are the material substances mentioned by Nicholson in his claim, and which form the component parts in his pavement substantially essential to his combination referred to by you in such answers.

374 (Defendant objects to question as improper for re-examination, and as not correctly stating the witnesses testimony.)

Ans. I understand the combination, as claimed by Nicolson, to be, first, a foundation combined and arranged as described; that is a support combined and arranged with a preventive to moisture, which foundation is combined with a superstructure consisting first, of long and short blocks so combined or arranged as to form cells or channels, and second, with a concrete filling placed in such cells or channels. This is substantially the combination and arrangement claimed by him. There are certain conditions or offices to be performed by some of these component parts; for instance, the short blocks or strips are required to form a wooden bottom to the cells separate and distinct from the foundation for the purposes named by him, the filling is also to be slightly plastic or elastic as he has termed it. These things are conditions or objects to be attained by this peculiar combination and arrangement, with some others, such as prevention of moisture above and below. He has mentioned the use of salt as an antiseptic, which he says, in his specifications, may be put in; but I do not consider that as a component part of his arrangement and combination, either in the claim or as a necessary part of the pavement. The material substances named by him as substantially essential to

375 his combination are, first, a support in the foundation, which may be either tarred paper, hydraulic cement, or a cheap flooring and tar, or its equivalent for the prevention of moisture, in addition. In the superstructure long and short blocks made of wood, so arranged as to form cells or channels or strips of boards, which are used as equivalents for short blocks, and which, perhaps, need not be specially mentioned, and a filling for the cells or channels so formed consisting of broken stone or gravel concreted with tar or its equivalent.

63d direct-int. State whether or not the short blocks so elongated and shaped, as described and shown in the question and answer No. 172 of your cross-examination, and in the section number three of the

model there referred to, would subserve the purposes and fill the office specified for his double wedged or pyrmidal shaped blocks by Wood?

Ans. I think they would; not as the form of the blocks, which are to be so as to contain the wedged principle. If they were so far elongated that a pressure upon one end would depress it without affecting the other end, or cause an elevation of the oposite end, the wedge principle would be destroyed, and the effect claimed by Wood to be produced by his combination of these peculiar forms would be lost. This effect is to be the same whether the blocks are high or low.

376 Direct-examination here closed.

P. A. HOYNE, *U. S. Comm'r.*

Witness, L. D. Bond, recalled on cross-examination.

180th cross-int. If the direct pressure should be from the tall block upon the centre of a short double wedge, might not that double wedge be three times the width of the tall block, and yet preserve in the course of short blocks the double-wedge principle,

Ans. It might to a limited extent, but it would reduce it pretty near to a single wedge if laid between courses of tall blocks. Laid with their broadest bearing surface upwards, as shown in figure "K," but if laid between courses of blocks laid with their broadest bearing surface downwards, as shown at figure "F," it would still operate as a double wedge, the extent being limited in only one direction. When we consider that Wood's pavement, as I said before, is primarily a stone pavement, I think it would be doing violence to his specifications to make them three times longer one way than the other, although it might not change the principle.

181st cross-int. Please to examine the strip of wood produced and shown to you and marked defendant's exhibit "C" to this your deposition, and state whether it is not the strip referred to in your answer to the 61st redirect interrogatory; also whether it was not shown to you by Martin on the occasion of the examination of the wooden

377 block pavement at the intersection of Clark and Randolph streets, to which examination you have already testified; also whether he did not then request you to make it so as to identify it, and whether you did not do so, and whether you did not then understand, from the surrounding circumstances, that it was a part of the pavement then being taken up, then under examination. Is it not now your best recollection that it was so stated; also in the same connection, whether such strip was not then heavily charged with moisture, and whether the wooden foundation which was then examined was then also heavily charged with moisture or not, and to what extent, comparatively.

Ans. It is the same strip which was referred to by me in that answer. It was shown to me at the time of such examination, and my attention then called to it by Mr. Martin. He requested me then to mark it so that I could identify it, which I did by cutting two notches, one in the fungus, the other a short distance from it. I did understand it to be one of the strips taken up at that examination, and have no

doubt but what it was; the outside appearance of the strip did not indicate that it was heavily charged with moisture, but when cut by the notches made by me, and also at the end cut in taking up,
378 it did appear to be quite wet; the foundation had the same appearance; externally it appeared quite dry, but when cut into showed that internally was wet, was considerably wet.

LESTER L. BOND.

Recross-examination here closed on behalf of defendant.

P. A. HOYNE, *U. S. Comm'r.*

Examination closed by the witness, Lester D. Bond, this Tuesday, Nov. 2nd, A. D. 1865.

P. A. HOYNE, *U. S. Comm'r.*

Subscribed and sworn to before me this 2nd day of November, A. D. 1865.

Further examination of witnesses adjourned till to-morrow, Friday, November 3rd, A. D. 1865, at 9½ o'clock a. m.

P. A. HOYNE, *U. S. Comm'r.*

Met pursuant to adjournment from yesterday, this Friday, November 3rd, A. D. 1865.

P. A. HOYNE, *U. S. Comm'r.*

Thomas D. Stetson, a witness produced on behalf of the complainant, and having been by me first duly cautioned and sworn to tell the truth, the whole truth, and nothing but the truth in the cause aforesaid, thereupon testified, as follows:

Direct-interrogatory first. What is your name, age, and occupation, and where do you now reside?

Ans. My name is Thomas D. Stetson; age, 38 years; residence, New York city; occupation, solicitor of patents.

Int. 2nd. State what have been your opportunities and experience in the study and understanding of labor-saving machines and various mechanical devices, and whether or not the observation and
379 arrangement and construction of pavements of any sort have been, within your experience, and also what has been your experience, in the investigation and examination of patents.

Ans. I worked at a mechanical trade making tacks and small nails by machinery as an apprentice and journeyman from the age of 16 to 21. I have since been almost constantly engaged in connection with machinery and inventions. I have practiced as a solicitor of patents in my own name since 1855, visiting the Patent Office and arguing cases there monthly since 1857. I have served as expert on patent questions before the United States courts since 1860. I was scientific and industrial reporter for the New York Daily Tribune about four years, and was almost constantly in contact with inventors and with experiments on inventions, and the describing and reporting the same in ordinary language. I have paid much attention to pavements,

and am very familiar with patents generally, but do not recollect any case when I have had occasion to study patents for pavements until the present.

Int. 3d. Have you examined, and are you familiar with, the reissued patent and specifications of Samuel Nicholson, of date December 1st, 1863, and numbered 1,583, as set forth with the drawings annexed in complainants Exhibit "B," in this cause.

Ans. I have examined and am familiar therewith.

Direct-int. 4th. Have you examined, and are you familiar
380 with, the English patent specifications of Richard Love, jr., David Stead, Thomas Wood, the younger, William Grimman, John Perring, Joseph Crannis, and Robert Kemp, and Henry Austin, respectively, marked defendants Exhibits "A," "B," "C," "E," "F," "G," "H," annexed to the stipulation in this cause?

Ans. Yes.

Int. 5th. State whether or not you find the invention and combination of said Samuel Nicholson, as set forth and claimed in his said reissued letters patent and specifications, described and set forth in the said specifications of Henry Austin, and whether or not the pavement so described by Henry Austin, in his said specifications, is identical with, or different in principle from, the pavement described and claimed in the said reissued patent and specifications of Nicholson; and if you shall find the same identical or different in principle, state your reasons for the opinion you shall express.

Ans. The construction or combination described in Nicholson's specification, the describing and claiming parts considered together, I do not find in Mr. Austin's specification. Mr. Nicholson's specification sets forth a construction in which there are three essential members, a foundation, a middle member or blocks, and a filling or top all constructed with certain conditions or essential requisites and combined and arranged in a pecu-
381 liar manner, so as to produce one structure possessing new and important useful qualities. I cannot find the same in Austin's description. Austin's is substantially different and not as good. It differs in principle. The foundation set forth in Nicholson's specification possesses two essential qualties, first, as support for the work above, and second, an impervious quality to prevent the passage of moisture. Austin does not describe any such foundation. Nicholson sets forth as middle member a series of long and short blocks, or blocks of different heights, resting on the foundation with the short blocks, alternating with long ones. Austin does not dscribe any such middle member. Nicholson sets forth a filling applied at the top, composed of gravel, with its interstices filled with tar, and held up beyond a possibility of working under the blocks. Austin does not describe filling or top so conditioned. The several members of the combination are all different, and the construction resulting is different. The Austin pavement fails to fulfil the conditions fulfilled by the Nicholson pavement. It does not stop moisture from permeating through the foundation. It does not hold up the filling so as to prevent its displacing the block, after the pavement is in use; it cannot, in consequence

of its difference in combination and arrangement, be so cheaply
382 constructed, and it cannot, by the action of the traffic over the surface, become so well tightened and consolidated, as the blocks shrinks away from the filling. All these reasons I give for the saying that there is a substantial difference in principle between the two pavements. There are several modifications of the construction described in Austin's patent. I am considering those which most nearly resemble that described in Nicholson's specification and claim. Nicholson describes several modifications of his members, but they all possess the essential characteristics I have defined.

Int. 6th. State what is the office and effect of the short blocks in Nicholson's combination and arrangement forming cells filled with gravel or broken stone and tar or cement.

Ans. They perform a very important function in holding the taller blocks at a fixed distance apart, both during the construction of the pavement and after it is use. When the pavement is in use they perform the additional function of holding the filling up to a considerable elevation above the base of the blocks, and thus diminish, and practically render impossible, the chance of the filling working under and lifting the blocks out of place, either in consequence of imperfections in the construction or loosening of the parts
383 after long use; and in addition to these two they perform the function during the early stages of the use of the pavement of supporting the mass of filling on the firm abutment afforded by the top of these short blocks, so that it is more effectually and certainly spread by the action of wheels and by the feet of animals to tightly fill the cavities or cells existing between the tops of the tall blocks.

Int. 7th. State whether or not you find in the specification of Henry Austin the short blocks referred to by you in your last answer as contained in Nicholson's combination or any equivalent therefor and give your reasons.

Ans. They are not them. Mr. Austin employs long blocks equivalent to Nicholson's long blocks. He describes no short blocks nor any equivalent therefor. He describes a filling which is a little obscure in its description, but which, I judge, is equivalent to Nicholson's filling, except in the fact that it is not supported at an elevation above the base of the blocks, but, on the contrary, goes to the bottom. He describes nothing resembling in appearance, in construction, or in function, the short blocks of Nicholson. He has nothing to hold the long blocks at a fixed distance apart, except as he expressly says, the securing of each independently to his foundation. He has nothing to keep the filling out of direct contact with the joints between
384 his blocks and his foundations, so that the least imperfections or working would introduce the filling under the blocks and commence the disruption of the structure; and he has nothing to firmly support the upper portion of his filling, and make it spread under the traffic, and compensate for shrinkage or movements of the long blocks, except the similar filling underneath; that is, similar filling extending all the way down. (Here witness examines specifications of Austin, and resumes.) He says, "with intervals or spaces

between them to the entire depth of the blocks these intervals or spaces may be of the width of an inch and a half or thereabouts, and are to be filled in with broken stone, refuse or broken slate, grit, gravel, sand, or any hard or fibrous substances. This filling, in being cemented or concreted together with liquid lime or cement poured in," and then names other adhesive materials for the liquid portion. This is the only place where his material between the tall blocks is referred to, and these are the only words. He does not describe or imply that the lower half or any other fraction of the space is to be fllled with something hard, which shall fill the whole space, and which shall not be subject to change of form or disintegration, so as to perform the duties of Nicholson's short blocks. I find much difficulty in conceiving any use of "fibrous substances" in lieu of the
385 hard substance he mentions as being irregularly filled into this space. I can't see how the fibrous quality of any substance can be made available without at same time involving an evil by the elasticity of the substance, which would allow it to yield downward under the pressure of a heavy wheel or the like on the filling, and would again distend itself upwards, and thus loosen the filling as soon as the wheel had passed; but, however, any fibrous material should be introduced, it would not by virtue of its fibrous quality as differing from broken stone, and the like granular and unyielding particles, approximate to Nicholson's short blocks, but would, on the contrary, be a modification in the opposite direction. Nicholson's short blocks perform, as required, not by virtue of their being fibrous; in fact wood is not, in its ordinary use, a fibrous material or known as such; it performs by virtue of its being hard and of a fixed shape, adapted to exactly fill the space, and neither send any fragments from itself under the other blocks nor allow any of the flinty masses in the filling above to work past it. I consider the word fibrous in Austin's specification to be some modification or invention which he has omitted to describe so as to make it intelligible. It is certainly not Nicholson's construction, and I therefore neglect it, except when specially challenged, and have given the reasons in full.

8th int. State whether or not cotton, wool, flax, and hemp
386 are substances known in the arts as fibrous substances, and whether or not such substances, or other substances of a similar character, would or would not, in your opinion, be equivalents for the filling of the cells or channels within the directions given by Austin in his specifications having reference to those directions, and the purposes to be subserved by said filling of which Austin speaks, and of which he directs said filling to be made.

Ans. Those are fibrous substances. I have never experimented on their use with tar or the like semi-fluid material in the pavement. They succeed admirably in filling the seams of ships, where there is no working of the sides of the cells, so to speak, and where there is no shrinking away of the enclosing walls and no percursive or other force intermittingly compressing them. If Mr. Austin knew, or now knows, how to use them well in his pavement filling, it was some different invention from Nicholson's, and I could not work it out suc-

cessfully without further instructions than he has given. It would not perform like Nicholson's pavement, for the reason that it would not produce the same effect in filling the tar, and the whole top of the pavement with grit. I think it could not be kept in the spaces between the blocks, and if it could, would make a slippery and bad pavement. Austin says that his pavement is to avoid slipperiness, and I think that fibrous materials would not fulfill his purposes. I
387 could make a good pavement from Austin's specification, but I should omit his use of fibrous materials as being one of the weaknesses common to inventors, the worst way among all he suggests for working it out.

9th Int. Suppose Nicholson's wooden pavement to be properly constructed either upon the first or second plan or method described by him according to the calls of his amended specification, annexed to his reissued letters patent, with ordinary mechanical skill and correctness; state whether or not the short blocks, or the strips inserted between the blocks to form the cells could or not, in your opinion, when such cells are filled with gravel or broken stone, firmly rammed, united with tar, or other cement, work up in the common and ordinary use of such pavement?

Ans. I think they would not work up.

10th Int. Having reference to the provisions in the specification of Nicholson, that in some of his modes of constructing his wooden pavement, blocks may be pinned together with wooden pins, and that the strips in his second method are to rest upon the foundation or support with the superincumbent mass of concrete filling pressing them down, state whether in your judgment the nailing of such blocks together, or of such strips to the foundation, would or would not be a mechanical change within the meaning of the specification?

Ans. It would certainly be a mechanical change within the meaning of the specification.

388 11th Int. Having reference to the direction given in his specification by Nicholson, state whether or not it would be a matter of mechanical judgment in constructing his wooden pavement to determine the length of the long and short blocks or strips relatively to each other, the consequent depths of the cells filled with gravel and tar depending on the location and probable prospective use of the pavement?

Ans. It would; and so long as the short blocks were of sufficient length, and the cells or spaces above them left of sufficient depth to perform all or either of the three functions described, any changes would be mechanical modifications of Nicholsons's construction. It might be modified to advantage in adapting the pavement to different uses or soils or positions. In case any such modification of the depth of cell should involve an important improvement, it might make a patentable idea engrafted upon or added to the Nicholson idea, but the construction would still involve Nicholson's, and the change would involve mechanical judgment; whether or not it should be considered mere mechanical judgment would depend upon the magnitude of the improvement thereby produced over the proportions designated by

Nicholson. He shows the cells one-half the depth of the long blocks. It would not be a matter of mechanical judgment to make them thus proportioned; it would only be a literal conformity with the specification.

389 12th Int. Do you mean to say that in your judgment there would be any patentable improvement in changing the depth of the cells by the relative disproportion of the lengths of the blocks under Nicholson's specification and as described by him, or that such specification confines him to the difference of four inches given by him, it being supposed that such change of the depth of the cell still fulfils the functions you have referred to in your answer?

(Question objected to as leading and suggestive, also as mistaking the testimony of the witness and for irrelevance.)

Ans. I can imagine no such patentable improvement, certainly none such has come to my knowledge. The dimensions given by the patentee does not confine him or those working under his patent to those dimensions.

13th Int. State whether or not you find the Nicholson invention and combination as set forth in his reissued specification described and set forth in the said specification of David Stead, and whether or not the pavement described by David Stead, in his said specification is identical with or different in principle from the pavement described and claimed by said Nicholson; and state your reasons for the opinion you shall express?

Ans. Nicholson's construction is not found in Stead's. Stead's is different in principle, it is not identical with Nicholson's,

390 because it has no foundation, and therefore fails to contain the combination found in Nicholson's, even if the other members of Nicholson's combination were described. I cannot find in Stead both of the other members. Stead describes a filling which approximates to Nicholson's filling, but lacks the gravel, or equivalent stony masses, his blocks are not Nicholsons', because they are not long and short blocks, but are all of uniform length. (Here witness examines Stead's specification.) Nicholson's foundation is not here, because there is no foundation combined with the pavement. Nicholson's blocks are not here, because there are no long and short blocks, unless the idea is very imperfectly contained in the deal ends, shown by *v v* in figure 20, in their relation to the other blocks. These deal ends are described as projecting above the surface of the blocks to afford "the hold for the feet of horses;" Nicholson's filling is not here, because the filling, such as it is, is not held up above the base of the blocks by resting on the tops of the short blocks, which in figure 20, the only figure approximating to Nicholson's blocks, would be the tops of the main blocks, and because the filling is not flinty and cannot produce by its disintegration and exposure to wear on the surface of the street, the effect of making the filling and the blocks gritty and durable, and preventing any of the surface from being slippery; the cells or cavities described by Stead for receiving his filling

391 are produced in a manner substantially different from Nicholson's, instead of being cheaply formed, or formed absolutely

without cost by the arrangement of long and short blocks, they are formed by cutting away a portion of the wood of the blocks. Instead of filling the space between the deal ends *v v* in figure 20, so as to be compacted and spread by the traffic and caused to keep the spaces always filled between the said deal ends, the filling does not cover the ends of the blocks, and cannot be so spread; in other words, it could not be arranged as in this figure, and the description thereof perform the functions of Nicholson's filling, even if it was composed of Nicholson's materials. Figures 21 and 22 show an absence of Nicholson's construction in the absence of the foundation and of the long and short blocks, but show a provision for holding up the filling and allowing it to spread under the trafic and keep his blocks tight. If the filling were of the same material as set forth by Nicholson, it would perform by spreading, and by inducing a condition of the surface of the pavement closely analogous to the effect Nicholson's filling, or the surface of Nicholson's pavement, but his filling not being the same, or substantially similar, it fails to contain even this part of Nicholson's combination. In short, Stead does not contain
392 Nicholson's construction, because it lacks his foundation and lacks his filling, and it does not contain his long and short blocks, alternating, except in figure 20. It is possible, as I have before stated, to consider the deal ends in that figure, which I understand to be narrow plank of greater depth than the blocks, as an equivalent, or partial equivalent, for the tall blocks in Nicholson's specification. And it is possible to consider the other blocks in that figure, although they are much wider than the tall blocks, as an equivalent, or a partial equivalent, for the short blocks of Nicholson. But I do not believe it necessary to draw refined distinctions about them, because the other elements described by Nicholson and forming essential parts of his combination are not combined with these.

At ½ past 1 adjourned to half past two o'clock, p. m.

P. A. HOYNE,
U. S. Com'r.

Met pursuant to adjournment.

14th direct int. Having reference to the whole description of Mr. Stead, and also particularly to the phrase in his specification on page 2, line 11, "the foundation being first suitably prepared to the required figure, by the usual well known means, to receive such wooden blocks, which are so disposed as to present an even and uniform surface," and also having reference to the description
393 on page 4 and line 7, of figures 18 and 19 of the drawings, and also to said figures 18 and 19 in the drawings, please state whether you find any artificial substratum or foundation described by Stead interposed between the blocks and the earth surface.

Ans. I do not find such figures 18 and 19, and the description thereof forbids the supposition that such was possibly intended.

15th direct int. State whether or not you find the invention and combination of Nicholson set forth and claimed in his said reissued letters-patent and specification described and set forth in the said

specification of Thomas Wood, the younger, and whether or not the pavement so described by Wood in his said specification is identical with, or different in principle from, the pavement described and claimed by Nicholson, and give your reasons for any opinion you shall express.

Ans. I do not find Nicholson's combination described in Wood's specification. The two constructions are different in principle. Wood's is different and inferior. It is not identical with Nicholson's, because it lacks Nicholson's foundation. The forms of the blocks are different from those described by Nicholson, and the difference involves a very important difference in principle, so far as the blocks are concerned. Wood's blocks wedge each other and cause the blocks which receive the most of the traffic to be supported by the wedge-like sides of the adjacent blocks. This involves a different
394 principle in supporting the weight upon the blocks than is found in Nicholson's. In other words, Wood's contains a principle which is not in Nicholson's. It distributes the weight received on one block, and by making the adjacent blocks contribute to support it, not latterly alone, as in Nicholson's, but also vertically, which is not in Nicholson's, he avoids any necessity for a foundation like Nicholson's, whether there is a necessity or not, in order to render Wood's useful. Wood has no such foundation. It does not describe or suggest anything of the kind. His descriptions, by which term I include the drawings as a part, and the whole character of his construction imply the reverse. (Witness here refers to the specification of Wood.) He says of his invention, that it gives the road—the pavement—such a compact character that it will serve efficiently on the softest or loosest kind of a basis. His words are, "give it a complete firmness and solidity, even when put down on a foundation of mere shingle gravel or sand." Among the modifications of his forms of blocks and their arrangements he describes one in lines from 23 to 26, page 3, which would be substantially equivalent to Nicholson's long and short blocks and filling. Except for the wedging form of the blocks, this wedging form would seriously interfere with the functions desired, if applied in Nicholson's combination; but I think it
395 would not altogether prevent the blocks from fulfilling the functions of Nicholson's long and short blocks, and of Nicholson's filling, if applied in Nicholson's combination. In other words, Wood's construction contains two of the elements or an approximation to two of the elements of Nicholson's construction, and entirely omits the third; it omits it by not describing it, and gives a very good reason why it is not wanted, because he introduces another principle which Nicholson has not, to wit: the wedging and mutually supporting principle. There is no reason to infer from Wood's specification, either the text or drawings, that he intended to make his pavement usually of wood. The word wood occurs but once, when he says of his blocks, "they may be of stone, wood, or any other substance or material suitable for paving." The ordinary material for paving does not decay.

Int. 16th. State whether or not you find the invention and combination of Nicholson as set forth in his reissued letters patent and specification described and set forth in the said specifications of John

Perring, and whether or not the pavement so described by John Perring in his said specification is identical with, or different in principle from, the pavement described and claimed by said Nicholson, and give your reasons for any opinions you shall express.

Ans. (Witness examines the specification of John Perring
396 and proceeds.) The combination of Nicholson is not in Perring's. They are substantially different in principle. Perring's fails to show the combination of Nicholson, because it has no long and short blocks arranged like his, and no filling. It has Nicholson's foundation. In other words, it has one member of Nicholson's combination. It is described in lines 29 and 30, page 2, It does not have either of the other two essential members. Perring's pavement is not equal in useful qualities to Nicholson's. None of the other pavements referred to are equal to Nicholson's. Perring's is not, because the substantial difference in the construction above the foundation makes a more expensive pavement and one that will not keep the blocks tightly held as they shrink, and will not keep them covered with tar and grit. The slips of wood between the blocks in Perring's pavement do not extend down and rest on the foundation, and could not support a filling in the same manner as Nicholson's short blocks, and there is no filling applied.

(Defendant objects to the clause in the answer beginning with "none of the other" and ending with "Nicholson," as not called for by the question.)

Int. 17th. What is the office of the slips of wood interposed between the blocks in Perring's pavement, and how near to the upper surface and to the lower surface of the blocks, as he describes the arrangement, do such slips of wood come; and state what is the difference, if any, between the two surfaces, upper and lower, when so arranged?

397 Ans. The office is to hold the blocks apart and form grooves for a foothold for the animals hauling loads over it. The slips extend up to within an inch of the top and down to within an inch of the bottom. The upper and lower surfaces are alike, except when the lower surface is provided with the stratum of concrete or equivalent, in which case the lower surface of the blocks immediately above is still exactly alike the top of the pavement.

Int. 18th. State what substances would be called for to be used in the place of the wooden slips described by Perring under the phrase "other elastic substances," in line 13, page 6, as equivalent for the wooden slips, having reference to the directions given by Perring, and the purposes and objects to be subserved by said slips as specified by Perring.

Ans. Anything having the shape of those slips and proper hardness would serve in lieu of them. I do not see any advantage in having them elastic, excepting in convenience of fitting and crowding together the blocks, together in matching the width of the street and the prevention of fracture in the slips when crowded afterwards.

Int. 19th. Suppose that the substance of cork or India rubber in its raw state were used for these slips in constructing Perring's

pavement state what would be the practical effect of such use, having reference to the directions given by Perring as to the manner
398 of constructing the pavement on the street width, such slips placed as he directs them to be, and hung upon dowells or wooden pins, with holes sufficiently large to admit of such play, as that the mass or slab would in use conform to the curve of the street; and also whether or not, when so constructed, water would be prevented from passing down from the surface of the pavement to the bottom?

Ans. Cork would not serve; it would be too soft when wet, and would become distorted and compressed by any force like an animal's foot powerfully applied to the blocks, and would retain their impression to a great extent in drying; India rubber vulcanized would answer well, but not as good as wood, and would cost fearfully; raw rubber would be to soft under an American sun, and would hardly do in England. Either of these or any other eminently elastic materials would hang very badly on the pins which supported them; they would probably sag between the pins and rest on the foundation, becoming, at those points, similar in position to Nicholson's short blocks, but their elastic character would loosen and throw out any filling applied above them. It would yield downward under each pressure of a wheel or of a foot and spring upwards again so soon as free. I think water would not be prevented from passing down by such arrangment.

Int. 20th. State whether or not you find the said invention and combination of Nicholson described and set forth in said spe-
399 cification of Joseph Crannis and Robert Kemp; and whether or not the pavement so described by the latter is identical with or different in principle from the pavement described and claimed by Nicholson, and give your reasons for the opinion you shall express.

Ans. Nicholson's construction is not shown in Crannis and Kemp; they are substantially different, because there is no filling. (Here witness examines the specifications of Crannis and Kemp.) They are different in principle; the principle of Nicholson is not here, because this member of his combination is absent, and the foundation may also be said to be absent, as there is no provision for making the foundation impervious to moisture in Crannis and Kemp's construction, long and short blocks are here, they are shown in figure 19, but there is only this one member of Nicholson's combination. In general terms Nicholson's blocks may be said to be here, but Nicholson's foundation below them and his filling above and between them are not here.

Int. 21st. State whether you find the said Nicholson's invention and combination described in the said specifications of William Grimman and Richard Love, respectively, or in either of them?

Ans. I do not; Nicholson's construction is not described in Love's specification, because there is no filling, his tall blocks are stone and not wood. It is not in Grimman's specification, because there is neither Nicholson's long and short blocks or his filling, both are substantially different in principle.

400 The complainant's counsel here said that they were through with the witness, and tendered him to the defense, but might have one or two questions to ask the witness in the morning; and examination here adjourned this Friday afternoon, November 3d, A. D. 1865, at 5 o'clock, till to-morrow, Saturday, November the 4th, A. D. 1865, 9½ o'clock, a. m.

P. A. HOYNE, *U. S. Comm'r.*

Saturday morning, November the 4th, A. D. 1865, the witness, Thomas D. Stetson, recalled on the direct examination.

Direct int. 22d. Please look at the drawing attached to the specications of Stead and state whether any of the modifications there represented, and which, if any, contain one tier of blocks resting upon another; and, if so, what office or function the said arrangement fulfills in such modification, and whether or not such arrangement would form a foundation substantially the same or substantially different in principle from the Nicholson foundation?

Ans. Two modifications present such feature; they are shown in figures 10, 11, 12, and 13, and are explained in the descriptive matter lines 17 to 33, page 3. The lower tier of blocks support the corners of the upper tier, and thus contribute to the stability of the pavement. The arrangement is substantially different, because the lower tier of blocks is not an impervious foundation like Nicholson's.

23d int. What do you find was the purpose and object mentioned and described by Stead in his specifications for creating channels or grooves or unequal surfaces in the forms of his pavement given by him containing them?

(Question objected to as irrelevant and as calling for the
401 contents of a written instrument.

Ans. To afford a surer footing.

Direct 24th int. Do or do not those channels or grooves or unequal surfaces described by Stead fulfil any other office than such as you have mentioned in your last answer?

(Question objected to as leading and irrelevant.)

Ans. I have some doubt. He speaks in four places, and with reference to four modifications of filling, or rather partially filling certain cells or cavities with cement or ashpalt, without describing the purpose. Such filling would not serve the purpose of Nicholson's filling, even if the other parts of Nicholson's combination were there, because Stead's filling contains no gravel or equivalent. I understand the cement in Stead's description to simply allow the formation of grooves which would otherwise be too deep, thus allow the paving to wear down lower before the grooves would be rubbed out. In short, the grooves are not described as performing any other function than affording a hold for the feet of animals. He makes them too deep to make them remain longer, then partially fills them with asphalt or cement, as may be found convenient, line 1, page 4, to prevent evils arising from the too great depth. He is particular to say, (here witness examines specifications of Stead,) lines 3 and 16, page 4,

"that he prefers to leave them entirely unfilled on the acclivities, where a sure footing is the most important."

(Defendant objects to so much of the foregoing answer as
402 commences with "such filling," and ends with "equivalent," and as commencing with "he makes them too deep," and ending with "depth," on the ground that such testimony is not called for by the question.)

25th direct int. State whether or not you find any difference between Wood and Nicholson, in the method of preparing the concrete, or of putting it into the cells; and if yea, state what that difference is, and what, if any, would be the practical results growing out of such difference in the construction of the pavement.

(Question objected to by the defendant as irrelevant.)

Ans. Concrete, so called, is the poorest material Mr. Wood names; his bituminous substance, heated with gravel, is his best, and nearest like Nicholson's. It differs from Nicholson's in being mixed and subsequently placed in the cavities. The practical results would be very important. Nicholson fills his cavities with his broken stone first, thus gets in all that the space can hold, and then applies his tar, to fill the interstices between the hard masses. Wood's would fail to be a substantial equivalent, in fact, for this reason, he could not get in the same quantity of stone, not apply the pasty mass as thoroughly into the bottoms and angles and cracks in his cavities. Wood's would also be very difficult to apply.

26th int. What would be the effect of first ramming the gravel or stone in the cavity, as described by Nicholson, and then filling it with the adhesive liquid or tar or cement, as compared with the mode stated by Wood?

403 (Question objected to as suggesting to the witness, and as irrelevant.)

Ans. The way to get the most stone in a cavity, except packing by hand, is to fill and shake, and subsequently compress or ram, while the stones are clean—shaking being impracticable, Nicholson gets the nearest possible, by filling and ramming while clean. The stones thus adapt themselves to each other without obstruction, and touch absolutely at a great number of points. If the tar is first mixed with them they work heavy or dead, and will not meet as closely at any point, and will not slip and roll into compact positions, but remain arched and widely separated. In order, also, to be sure that the interstices are filled in Wood's method, a surplus of tar must be mixed with the stone, because the capacities of the cavities is very irregular and cannot be estimated closely. This surplus of tar further increases the scarcity of the stone in a given size of cavity. I think I may safely say that it would make a substantial difference between the two fillings, Wood's being much more costly, by reason of the greater proportion of the costly material, also the increased labor of applying it; and Nicholson's being much the best, by reason of the greater proportion of the more enduring gritty material.

27th int. State whether or not you find in the Wood specification

a special form of blocks as an essential element of his combination, and for a special object and purpose, described. If you shall
404 state you do, state further whether or not you find that element in the Nicholson combination, or whether or not you find in the latter a different form of the blocks, new as to Wood's patent and a substantial departure from Wood's special forms, resulting in new effects. If yea, state what those effects are in reference to the practical use and operation of the pavement, and also in reference to the facility or cost of the construction; and in this connection, state whether or not you find a practical benefit effected by Nicholson in his combination; and if so, whether or not you regard these new forms combined by Nicholson with such new results, constituting a difference in principle between Nicholson and the construction found in Wood.

(Question objected to by defendant as leading, suggestive, and irrelevant, and as calling the witness to travel over the same ground on which he enlarged fully before the witness was tendered to the defendant.)

Ans. There is a substantial difference between the blocks of Nicholson and Wood. The difference is due to this difference of form. The difference makes Nicholson's better than Wood's—better because they are cheaper to make, and can be laid indiscriminately, without selecting which shall apply to which, and without requiring several setts, two setts of tall and two of short blocks, in order to apply the blocks, and fill the spaces. Wood's form is an essential element of his combination for a special object and purpose. That element is not in the Nicholson construction. The form of
405 Nicholson's blocks is parralel instead of wedging. This is new as to Wood's patent, and different in principal, as I have explained. The difference in favor of Nicholson's new form is not only in the economy of production, assorting, and laying, but also in the effect after being laid. Wood's cavities would discharge the filling upward, or work it out more easily than Nicholson's, if made with the tall blocks small end upwards, and the tall blocks would break off at the corners, and all round the edges, more easily than Nicholson's if laid the way he, Mr. Wood, describes, with their small ends downwards. This is a substantial departure from Wood's special forms, resulting in new effects, and these new effects are useful, and make an important improvement in the pavement, considered with reference to the blocks alone, and without reference to the other parts of Nicholson's combination. I said yesterday that I could make a pavement from blocks in the form shown by Wood, applied in the proper relation to the other elements of Nicholson's combination, which would possess some of the advantages of Nicholson's, but the change in the forms of the blocks makes a much better pavement, substantially better by reason of that change. It makes a difference in principal, additional to the other differences before considered. Wood does not limit himself, he says, to any particular angle, and he describes (here witness again examines the specifications) some with a very small angle, line 16, page 2, but he

406 does confine himself to making them sections of pyramids and double wedges, all cut in the same angle in the lines immediately preceeding.

The direct examination of the witness was here closed, and the witness, Thomas D. Stetson, tendered to the counsel for the defendant.

P. A. HOYNE, *U. S. Com.*

Cross-examination of the witness Thomas D. Stetson.

Opended by counsel for defendant, Edward Martin, esq.:

First cross-interrogatory. Is not Stead's filling an essential element or member of his combination, although he says his pavement may be constructed without it?

Ans. No.

2d cross. In the combination of a pavement when the directions for carrying out the invention specify, in the first method detailed in the specification, a given material substance for the filling, and there are several other modifications in the same specification, is that substance an essential member of the combination?

Ans. Not necessarily; it depends on what, among all the matter or devices described, forms the new and useful feature. If that new feature be a combination of old features, then each of those old features which make the combination are essential members, and all the other matter in the specification is not essential.

3d cross. Suppose Stead, in his first directions for carrying out his invention, had specified a filling consisting of gravel with tar,

407 that filling so composed would have been, and would it not, an essential member of his combination?

Ans. No, sir; that fact would not make it so.

4th cross. What is the thinest layer of tar paper which, being placed upon the surface of the earth, would, without reference to its affording any support to the blocks, prevent moisture from being absorbed from the ground by them.

Ans. One thickness, about 1-32 of an inch.

5th cross. Would lime mortar, two inches thick, as the term lime mortar is usually understood in commerce and in mechanics in America, be an equivalent foundation to tar paper for block pavement like Nicholson's superstructure?

Ans. Lime includes both fat lime and hydraulic lime. Mortar is made of all characters, between very permeable and almost obsolutely impermeable; the term lime mortar includes both. The commonest lime mortar would not be equivalent to tarred paper in excluding moisture. Tarred paper would stop moisture the best.

6th cross. Does not the term lime mortar, in its common acceptation in commerce and among mechanics in America, generally mean a mortar made with quick lime?

Ans. I think it does, both in America and in England, but am by no means certain.

7th cross. Would a foundation of a mere flooring of cheap boards, and a foundation of the one thickness of tar-paper to which you have referred, be substantial equivalents, one for the other, as a
408 foundation for the superstructure of a wooden pavement like Nicholson's, where the boards contain no tar or any preventive of moisture?

Ans. No.

8th cross. If the description of the foundation in a specification were that the surface of the earth might be covered with tar-paper, or with other preventive to moisture being absorbed from the ground by the blocks, would such words "other preventive to moisture" include any device or arrangement which might produce that effect, or would they be limited to tar paper and its eqvivalents?

Ans. It would include as suggested, and not be limited.

9th cross. Suppose that instead of the directions for the foundation and support, set forth and described in Nicholson's specifications in his reissued letters patent, a patentee should in his specifications first declare that his invention was a new and useful in wooden pavement, which was fully described and represented in the specifications and accompanying drawings, and in his first directions in detail for carrying out his invention, should say, "in order to prevent the blocks being forced below, they may be pinned together with wooden pins extending from block to block; the earth upon which the pavement is to rest may be prepared to receive the pavement, by covering its surface with tarred paper or with other preventive to moisture being absorbed from the ground by the blocks;" and in
409 his summing up he should declare that his invention was such an arrangement of [of] the blocks, or the wooden portions of the pavement, that there might be cells or channels formed by such arrangement of the blocks for the reception of his filling, each cell having a wooden cell for the filling to rest on, whereby, when pressed down, it should be prevented being forced through the cavity, and should have said nothing at all about foundation or support in his claim, would you find in such supposed specification, direction, or claim, as stated in the question, the foundation and support, or a substantial equivalent for the foundation and support, stated by you to be the first member of Nicholson's combination?

Ans. Yes; the pins would relieve the foundation of a great portion of the strain due to an equal pressure on the blocks, and help it to endure.

10th cross. Would the pins in such supposed pavement be a substantial equivalent in principle for the support which you have named as one of the elements in the first member of Nicholson's combination?

Ans. No; it would contribute to the effect described of holding up the blocks evenly, but in a substantially different way.

11th cross. Would the foundation, then, supposed in the 9th interrogatory be substantially the same in principle as the foundation which you stated to be the first member of Nicholson's combination?

Ans. Yes; it would stop moisture, and would mechanically
410 support by assisting the pins, or allowing the pins to assist it.

12th cross-int. To the pavement; at what places have you particularly directed your attention, and has such attention been paid to the practical operation of wood paving in such place or places?

Ans. Clark street and other streets here in Chicago; Superior street, Cleveland; Court street, Boston—I think it was Court street—are the only wood pavements, unless we include plank roads and bridge floors, that I ever examined, in use. I have examined pavements generally in a great many other places.

13th cross. When it was that you made your observations of the wood pavement in Chicago?

Ans. In the summer of 1862, the summer about June, 1863, November, 1863, and this week.

14th cross. Who was present when you made your examination this week?

Ans. I saw a mass of old pavement on the floor of the United States commissioner's office, in the court-house, in the presence of Mr. Goodwin and several others; saw some new pavement being constructed around the court-house in his presence; saw some new pavement being constructed on Wabash avenue, in presence of the contractor or foreman of the job, name unknown; and the surface of the
411 pavement on Clark street, in the vicinity of the Sherman House, alone. Both these last streets and the job near the court-house—I mean the post-office building—custom-house building, I learn, it is generally called; I have studied several times this week. None of the counsel have been with me; I had no assistance.

15th cross. Have you have had any practical experience in constructing wooden pavements? If so, where, when, and how long?

Ans. I never worked on any or was interested in any.

16th cross. Besides the specifications you referred to in your direct examination, are you acquainted with any of the methods which have been invented or patented in England for wooden pavements? If so, state how many such inventions have been so patented, and whose they were.

Ans. I think I am not acquainted with any.

17th cross. Of the specifications which you say you have examined, which of them comes the nearest to Mr. Nicholson's combination?

Ans. Crannis & Kemp and Grimman & Perring have Nicholson's foundation; one member only of his combination. Love have his tall and short blocks; and although the tall blocks are stone, I think I may say that he has that member of his combination. So by a rather forced construction may Stead's figure 20 be said to have that member; Stead has only this member of Nicholson's combination; Austin has Nicholson's filling, but no other member of Nicholson's combination.

Crannis & Kemp, I will amend by saying, have also the long
412 and short blocks, the second member as well as the foundation of Nicholson. None of the others have but a single

member. Estimated mathematically, then, I should say Crannis & Kemp were the nearest, because they have two of the three essential members in Nicholson's combination. Wood has a partial equivalent for Nicholson's blocks, long and short, sandwiched together, and a partial equivalent for his filling, which may, perhaps, raise Wood's to the same position. I am embarrassed to know whether to consider them for the purposes of this question as equivalent or not. As the analogies exist in Wood's pavement, they are embarrassed by such additional principles as would go far to defeat their object; still Wood's would make a pretty good pavement if made of any other material than wood; I mean any more durable material, and one not subject to sinking and swelling. On the whole, Crannis & Kemp have two elements without embarrassment or question; while Wood's has two elements much encumbered, and very imperfectly, if at all. I call Crannis & Kemp the nearest.

18th cross. Is there any material substance directed by Nicholson to be used in his pavement which was not at the time of his invention well known and used in other pavements for the same or like purposes as Nicholson uses them? If so, what are they?

(Question objected to by complainant as calling for evidence immaterial and improper under the issues in this case.)

Ans. Yes; the tarred paper was new in pavements, so far
413 as my knowledge extends. I don't think of any more. I think the rest are all old.

19th cross. Is it not known and understood in the art of the construction of pavements that for many years prior, and up to 1838, a concrete foundation was a well-known part in the construction of pavements? had not the ancient Roman roads alternate layers of concrete or impervious cement and rubble for foundation? Do not the remains of such roads exist to this day. Is it not well known in the art that ancient Peruvian roads were constructed with flag stones covered with bituminous cement, and were not the blocks of wood wood, which were laid for wooden pavements in New York several years ago, and prior to 1847, or the larger portion of them, coated or saturated with tar?

(Question objected to as immaterial and improper under the issues in this case.)

Ans. I don't know about the blocks in New York or the Peruvian roads; hydraulic cement had long been known as a material in the construction of pavements, and the old Roman pavements were constructed of alternate layers of loose stone and of hydraulic concrete and are in pretty good condition now. I think there is some mistake in the mind of the counsel about New York wood pavements; I have lived there since September, 1851. I should say that within modern times concrete was not common in pavements; certain specific
414 constructions of pavement contained it, but it was not in common use.

Cross-int. 20th. Do you know that the common stone pavements in England were not laid upon a foundation of gravel and some kind of cement prior to 1838?

(Question objected to for same reasons as last interrogatory.)

Ans. I do not know how every pavement was constructed, but I am very firm in the conviction that it would be an uncommon pavement now, and would have been any time in this century, to lay common stone on a foundation of gravel and cement. The Russ pavement in Broadway, New York is composed of square blocks of hard stone resting on and embedded in such a stratum. A pavement has been used to some extent in England, composed of squared stone laid on sand with the joints between the stone filled with cement; such were not common, and common stone, round paving stone, were never laid in cement within my knowledge or belief.

Cross 21st. What was the foundation of the Nicholson pavement you saw in Boston, and was it impervious to moisture?

Ans. It was not Nicholson's that I saw; it was a smooth pavement, very slippery.

(Defendant moves to strike out the last clause of last answer.)

Cross 22d. Did you ever see a wooden foundation to a
415 Nicholson pavement which was impervious to moisture? If so, how were the joints between planks made water-tight?

Ans. I never saw any with the joints made tight; all that I have seen building, and the old pavement lying in the custom-house building, are liable to be opened at the joints; they are made of boards.

(Complainant objects to the answer last given, for the reason that the evidence is immaterial and improper.)

Cross 23d. Did you see the piece of wood paving on the milldam, a continuation of Beacon street, in the city of Boston, in Massachusetts? and if so, what was its foundation?

Ans. I never saw it.

(The witness here wishes to correct his answer to cross-interrogatory 17th, in which he hurridly analyzed all of the English specifications as compared with Nicholson's, to say which was the nearest like his.)

I there gave Crannis and Kemp Nicholson's foundation. I was mistaken, Crannis and Kemp has a plank platform without tar or other impervious preparation. It is not Nicholson's foundation. Crannis and Kemp has but one member, the tall and short blocks of Nicholson's combination. This changes the general answer to the interrogatory; it reduces Crannis and Kemp like the others, except wood as to single members leaving wood as before without a single member in full, but with partial equivalents of two members. I think I will call Wood with his feeble representation of two members
416 the nearest like Nicholson's pavement.

Cross 24th. How many days, about how much time have you spent in the examination of the English specifications about which you testified in your direct examination?

Ans. I arrived in this city Tuesday afternoon last, and have done nothing else since but study this patent of Nicholson and the several older ones, English ones. That has been my business, it is now, Saturday night. I testified all day yesterday, and to-day examining the patents frequently; while so doing I had spent Wednesday and Thurs-

day, and part of Tuesday on the subject. I should say half the time was on the British patents, one day and a quarter.

25th cross. In placing Nicholson's blocks on his foundation upon his second method would it be any departure in principle from his combination if slight cavities or cells, say from half an inch down to nothing, should exist between the tops of the tall blocks, the blocks being close together at the bottom. If so, would it also be a substantial departure from the principle of that pavement if the blocks stood the other end up, so that they should be close together at the top, and have the slight space cavity or cell above referred to existing between their ends upon the foundation?

Ans. Yes; such a construction would be a defect and a departure from the principle of the invention to the extent to which it was carried. It could not be entirely outside of the principle of the
417 invention until it was carried very far, so far as to render the construction and use of the pavement impracticable. I should think as wide a separation at the top or bottom as would arise from placing Mr. Wood's block irregularly or with their wrong ends uppermost would be practicable, and would stand some chance of realizing the benefits of Nicholson's combination, but it would be a very defective construction, and Mr. Nicholson's blocks with parallel sides, in other words, prismatic forms, or so nearly those as are ordinarily produced in saw-mills, would be an immense improvement introducing a new principle to mutual support of the blocks laterally by their contact, which the supposed bad construction would not have.

(That part of the answer objected to by defendant commencing with the words, "I should think," and ending with the last word of the answer, as not called for by the question.)

26th cross. Is not elasticity in wooden pavement deemed one of the peculiar advantages of such pavement.

Ans. Yes.

27th cross. For what purpose does Nicholson direct his blocks to be pinned together.

Ans. To make them mutually support each other vertically by the strength of the pins, which would have to be sheered off before one could sink without dragging down its neighbor.

418 28th cross. When Nicholson's pavement is constructed upon a solid foundation, say wood or hydraulic cement of a sufficient thickness to support the superstructure, would there be any danger of the blocks sinking below each other, and is there any other direction in his specification in relation to such pinning of his blocks except what you have just referred to.

Ans. There is no other direction than that referred to; when the blocks rest upon a firm foundation there is no danger of the blocks sinking below each other until the foundation or the blocks begin to fail.

29th cross. Have you any practical experience of the tendency of Nicholson's strip to work up where it is introduced edgwise and resting on the foundation.

Ans. I have not.

30th cross. Will you please examine the colored drawings in Stead's specifications and state whether there is any indication in that drawing that the filling may be concrete or gravel or the equivalents of either of them.

(Question objected to on the ground that there is no such statement in the text of the specification.)

Ans. The spaces not between the deal ends v v, which by my analysis I compare to the small blocks of Nicholson, but the triangular small spaces existing between the main blocks, which by my
419 forced construction I consider approximating to the short blocks of Nicholson, are represented speckled with fine dots, assuming the scale to be anything reasonable, so that the blocks will be possibly made out of a single tree, especially an English tree, the spots would be too small to indicate gravel. It is the mode of representation generally employed to indicate a conglomerate. It might, I think, be understood to indicate in this drawing either sand mingled with asphalt, or any other fine stuff mingled with something else, or wood presenting the end of the grain to the eye, or the small stone or gravel of Nicholson's filling, except for the language of the text describing it; the text describes wood, or cement, or asphalt for the filling of spaces similarly dotted in figure 16, and says of these spaces, figure 20, that "may be filled up or left partly unfilled for the purposes hereinbefore alluded to." There is no difference in the dotting in the two figures, both describe spaces extending clear down through the whole depth of the blocks and thus filled up.

31st cross. Suppose that Stead's pavement was constructed strictly according to his specification as you interpret it, except that his cells or grooves contain a filling of broken stone concreted with cement, would a pavement so constructed be substantially the same, or substantially different from, the pavement patented by Stead?

420 (Question objected to as immaterial and irrevelant.)

Ans. It would then contain the principle of Stead's pavement, all of it, so far as I can see, with a new principle due to the stony masses.

32nd cross. Would the pavement be substantially different from the pavement patented by Stead? Please answer as explicitly as you can.

(Question objected to, that it is a repetition of the last preceeding question which has been fully answered by the witness.)

Ans. It would be one of the constantly recurring cases in the progress of improvement of one invention or new principle being added to another. The addition would not, in this case, so far as I have yet revolved the matter in my mind, remove any quality or effect previously possessed by the Stead pavement, for that reason it would be unequivocally the same in principle; at the same time the addition would give an additional valuable property to the pavement, which would be important and substantial, and would involve a principle not in the Stead pavement before, it would for this reason just as unequivocally be different in principle; it would be both similar and different—similar in one respect and different in another—similar in principle and different in principle.

33d cross. Assuming the Stead patent to be for a combination, would the supposed construction be an infringement of such combination or not?

421 (Question objected to, that it is not competent in American law for a witness to be enquired of or answered as to whether or not one machine, or supposed machine or combination, is an infringement upon another.)

Ans. It certainly would.

34th cross. Suppose Stead's patent to be a combination consisting of the elements, as you understand them, of his pavement, and suppose a pavement be constructed of the materials and in the manner stated in cross-interrogatory No. 31 and 32, would not such a pavement so constructed be substantially the same in principle as that combination.

(Question objected to for the reasons that it is a repetition of interrogatory 32 which had been fully answered.)

Ans. Stead claims making a road of hexagonal blocks and wedges or other pologonial blocks, keyed at the highest part by a wedge, so as to slope from the centre to the sides, as in figures 1 and 2, and again by rhomboidal blocks with the ends bevelled, as in figure 3, and upper and lower courses of blocks, as in figures 10 to 13, whatever their shape, and road blocks having various curved or angular sides, as in figures 23 to 25, and a road formed with blocks having the upper sides cut away, as in figures 21 and 22, and a road formed of blocks joggled or notched into each other, as in figures 6 to 9. He does

422 not claim anything about filling. I suppose what he claims was new, and what he does not claim was old; but it is very common to err in these respects. Now, if this supposition is correct, the introduction of broken stone would not remove those features nor disturb their operation so far as I can judge, and the pavement in the several modifications would contain the several new principles claimed; but if the pavement really possessed some new principle due to a combination of his blocks with a filling of asphalt, the effect of which would be destroyed by introducing the stony masses into the asphalt, then the pavement, so modified, would not be the same in principle as Stead. I believe the first supposition more likely to be correct.

35th cross. Assuming Mr. Stead's pavement to be a combination consisting of his blocks, as shown in those figures, which admit of a filling, and the filling which you have described as his, now, if the pavement were constructed as supposed in interrogatory 31, that is with broken stone for the filling, would such pavement be substantially the same in principle as Stead's combination, as supposed in this question?

(Question objected to, that the same question has been substantially put several times before, and substantially answered in the only mode in which it can be correctly and fully answered.)

(Defendant moves to expunge the objection as suggestive to the witness.)

423 Ans. It would be the same in principle.

36th cross. Suppose a pavement to be constructed strictly

after the Austin's specifications, and with the filling of the hard or fibrous substances within his specification, and that such filling fell short one inch of the top of the blocks but filled all the rest of the cell, would a pavement so constructed be substantially the same, or substantially different in principle from the Austin pavement? Please to answer as concisely as you can, without troubling yourself to give your reasons for your opinion.

(Question objected to as immaterial and irrelevant, and as undertaking to restrict the witness as to what he shall answer.)

Ans. It would be the same.

37th cross. Which is the thinnest fluid t ar boiled down to the proper consistency for the concreting purposes of Nicholson's, filling or water?

Ans. Water.

38th cross. Suppose Austin's pavement to be constructed as he directs, and with ordinary mechanical skill, and filling to be a gravel or broken stone concreted with tar, would not such filling, when exposed to public travel, spread latteraly under the pressure of the traffic upon its surface?

Ans. It would be likely to.

39th cross. Does cement, as that term is ordinarily used and understood in commerce, and among mechanics, include concrete?

424 Ans. No.

40th cross. Were you ever in a storm at sea?

Ans. Yes.

41st cross. Does the words stone occur more than once in Wood's specifications?

Ans. Stone occurs once, and stones once; stone occurs but once as the material for his blocks; the other place is speaking of curb stones.

42d cross. You speak of shrinkage in Perring's blocks, and you refer to a shrinkage of the blocks from the concrete in Nicholson's pavement; would such shrinkage, in a block of pine wood of the size and form commonly used in Nicholson's construction, say four inches thick, amount to any appreciable quantity? If so, how much? How long will it take in the kind of pine wood appropriate for that purpose, and in what direction would such shrinkage occur, in reference to the length, width and thickness of the block?

(Question objected to, so far as it speaks of wood, usually employed. Question modified, and objection withdrawn.)

Ans. I think it would shrink appreciably; I judge it would shrink something like the eigth of an inch, in the course of the first two months very sowly, almost inappreciably; a few months longer, it would be due partly to the shrinkage ordinarily so called, and partly to the mechanical compression it would suffer from the compacted filling; they would both be in horizontal directions, that is, across, and not parallel, to the grain of the wood.

425 43d cross. Suppose the Nicholson's pavement to be strictly constructed according to either of his methods, except that the concrete was made before hand, and filled in hot, a mass ready

mixed, and with as much gravel in the concrete as such circumstances will permit, would the pavement, when so constructed, be substantially the same, or substantially different in principle from Nicholson's pavement?

Ans. It would contain a part, and an important part, of Nicholson's construction; it would be the same in principle.

The witness, Thomas D. Stetson, was here recalled on the direct examination.

28th direct int. Please explain the effect of moisture as applied to the materials of roads and pavements.

(Question objected to by defendant as no competent on re-examination.)

Ans. Variations in moisture are the great disturbing elements that destroy roads and pavements; soil which is firm when dry becomes very soft and unreliable when filled with water. Every variety of earth differs in its action, but nearly all are more or less treacherous in this respect. Common street dirt, composed of matter abraded from the pavement with the droppings of animals, and the light dust blown from other places, becomes especially soft when wet, and cannot perform by lodging in cavities the functions of Nicholson's
426 or any other serviceable filling. A stratum of tarred paper, if only sufficient to stop the water which falls on a street from sinking into the soil, would support a pavement indirectly with great efficiency, by preserving or tending immensely to preserve an uniformly firm character in the soil itself. In other words, Nicholson's tar paper foundation, whether made as thick as represented in the drawing, or thin enough to be consistent with reasonable economy, would support the blocks more than might be supposed, effecting the purpose, partly by the direct tensile strength of the material, but more by its insuring that itself shall always be firmly supported by the soil beneath. One main reason why broken stone forms a good foundation for every structure, is that it is not sensibly affected, I think I may say, not affected at all, by moisture; its mechanical character is the same, whether absolutely dry, or in the extreme reverse condition; occasioned by the thawing of the earth in spring. The decay of wood is so well known to be affected by moisture that I think I can throw no light on it.

(That part of the answer objected to by defendant commencing with the words "and cannot," and ending with the word "filling," and that part of the answer about tar paper, as not called for by the question.)

THOMAS D. STETSON.

Subscribed and sworn to by the said witness, Thomas D. Stetson, before me, and in my presence, this Saturday, November the fourth, A. D. 1865.

P. A. HOYNE, *U. S. Com'r.*

427 Further examination of witnesses was here adjourned till Monday morning next, being the sixth day of November, A. D. 1865, at 9½ o'clock, a. m.

P. A. HOYNE, *U. S. Comm'r.*

MONDAY MORNING, *November the 6th*, A. D. 1865.

Met to pursuant adjournment, and the examination of witnesses resumed. Reuben Cleveland, a witness produced on behalf of the complainant, called sworn, and testified as follows:

Interrogatory 1st. What is your name, age, and occupation, and where do you reside?

Ans. My name is Reuben Cleveland; my age is 51 years and upwards; I am a builder by trade; I reside in Chicago.

Int. 2nd. State what have been your opportunities and experience in the study and understanding of labor saving machines, and various mechanical devices, and also what has been your experience in the investigation and examination of patents?

Ans. I have been acquainted with machinery, more or less, ever since I can remember. I served three years at the millwright business. I owned and carried on a foundry and machine shop for two years in Canada West. I have been partial owner, and carried on planing mill, sash, door, and blind factory, in this city, several years. I have been engaged in several patent suits as an expert, and have owned some few patents.

Int. 3d. Have you, in the course of your experience, up to this time, had occasion, among other things, to examine and pay attention to the subject of street pavement? and if so, state where,
428 and to what extent, and also what you have been engaged in for the last four years

Ans. In my travels through the several cities in the United States I have taken particular notice of pavements, but more especially in this city; having a common interest with all other citizens of Chicago in the paving of our streets, I have watched it with a good deal of care. In the fall of 1861 I went into the army, remained there for one year, since which time I have not been engaged in any particular business. The year of 1859 I was superintendent of public works for the city of Chicago, had supervision of all the pavements and improvements on the streets. I held the office in that connexion one year. South Clark street was filled, curbed, and paved from Washington street south as far as Polk street during this time. There was a good deal of street improving done that year. I don't recollect of any other wood pavements being built that year; several stone pavements were constructed, and a great deal of gravel streets done that year.

Int. 4th. Have you examined, and are you familiar with, the patent and specifications of Samuel Nicholson, of date December 1, 1863, and numbered 1,583 of reissues, as set forth with the drawings annexed in complainant's Exhibit "B" in this cause.

Ans. I have examined, and am familiar with, the patent those specify.

Int. 5th. Have you examined, and are you familiar with, the English patent specifications of Richard Love, jr., David Stead,
429 Thomas Wood, the younger, William Grimman, John Perring, Joseph Crannis, and Robert Kemp, and Henry Austin, being

defendant's Exhibits "A," "B," "C," "D," "F," "G," and "H," annexed to the stipulation in this cause?

Ans. I have examined the above-named patents and specifications, and am familiar with the same.

Int. 6th. State whether or not you find the invention and combination of said Samuel Nicholson as set forth and described in his said reissued patent specifications described and set forth in the said specification of Henry Austin, and whether or not the pavement so described by Henry Austin in his said specification is identical with, or different in principle from, the pavement described and set forth in the said reissued patent and specifications of Nicholson; and if you shall find the same identical or different in principle, state the reasons for the opinion you shall express.

Ans. I do not find the invention of Samuel Nicholson in the specifications of Henry Austin, neither do I find the pavement of Henry Austin identical with or substantially the same in principle with that of Samuel Nicholson. Samuel Nicholson described a foundation composed of tarred paper, (here witness refers to and examines Nicholson's specifications,) lime mortar, or hydraulic cement, or a cheap flooring of boards, the boards to be coated with tar or its equivalent, for the purpose of preventing the absorption of moisture from the ground into the superstructure above, which is made a very important part or principle in Mr. Nicholson's foundation. Mr.
430 Austin claims a foundation of slabs, planks, or other pieces of wood constructed in compartments, to be supported by ledges or stringers, glued, cemented, or otherwise fastened to the compartments on the surface of the prepared roadway, and does not claim any preventive to moisture nor provide for any, which I consider as entirely different in principle from that of Samuel Nicholson. Samuel Nicholson directs that his superstructure shall be composed of a series of long and short blocks, so combined and arranged as to form cells or grooves for the reception of the filling, the bottom of those cells to be formed at an elevated position from the foundation, say about half way from the foundation to the top of the long blocks; those short blocks form a support to the long blocks; also a floor or bed for the concrete filling in connection with the further property of sustaining the gravel and preventing it from working down under the long blocks, thereby upheaving them and causing a rough surface and in time a total disruption of the superstructure. He also claims a concrete composed of broken stone or coarse clean gravel filled into those cells or channels and rammed to a certain consistency, with the addition of mineral or vegetable tar poured into the cells or channels, permeating into the cavities left in the stone or gravel, and thereby forming one compact mass of filling. He claims also that tar should be poured over the whole face of the pave-
431 ment to prevent the moisture soaking down into the superstructure. The filling being of an elastic nature, is capable of expansion by the wheels of vehicles or the feet of animals, thereby filling all interstices which may be caused by the shrinkage of the blocks, and entirely preventing the moisture from the body of the

pavement or the superstructure. Mr. Austin claims a superstructure composed of blocks all of one length, glued, cemented, or otherwise fastened on to the compartments above mentioned, at a distance of about one and a half inches apart, those channels extending from the top of the blocks to the foundation are to be filled with broken stone, broken or refuse slate, grit, gravel, or sand, (here witness examines the Austin specifications,) after which he applies tar or some suitable cement to the channels, totally neglecting any preventive to moisture from above or below, with the exception of the material used in the cells and for the glueing of the blocks to the foundation. I therefore consider the pavement constructed by Samuel Nicholson and the one set forth by Henry Austin to be widely different in principle and construction.

Int. 7th. State whether or not you regard the different modes of constructing his foundation by Nicholson, referred to by you in your last answer, as equivalents for each other, and as calling for the construction of a foundation to effect the described purpose alike; and, in this connection, what is the substance in the art spoken of as lime mortar or hydraulic cement?

432 (Question objected to as leading and assuming that the terms lime mortar and hydraulic cement mean the same substance.)

Ans. I consider them equivalents for one another. The substance here spoken of as lime mortar or hydraulic cement, in my opinion, was intended to answer a certain purpose, that is the prevention of moisture being absorbed from the ground into the pavement. The patentee in this case in writing out his description spoke in the same terms that any architect or builder would speak in were he going to construct a foundation for the prevention against moisture. He speaks of lime mortar as it is spoken of generally in connection with hydraulic cement, after he had mentioned the lime mortar, that he might be perfectly understood, he said, or hydraulic cement.

8th int. State whether or not you regard the described foundation of Nicholson as involving any other function than the prevention of moisture, to which you have referred.

Ans. In connection with the prevention of moisture, the foundation is intended to support the blocks and form an even surface.

9th int. State whether or not you find described in the specifications of Henry Austin the short blocks referred to by you as a part of Nicholson's combination, or any equivalent therefor, and give your reasons.

Ans. I do not find the short blocks referred to by me in the
433 description or specification of Henry Austin, neither do I find any equivalent for the same. As I before said, they are glued or cemented on to the compartments about one and a half inches apart before being laid on to the street; they are then described to be filled with broken stone, broken or refuse slate, grit, gravel, or sand, or some other fibrous substance, after which they receive a coating of tar. Therefore, I do not find any equivalent for Nicholson's short blocks or strips.

10th int. State in what condition the substances described by Austin for the filling of his cells or channels must be in order to be united or concreted with the tar or cement and in order to subserve the purposes of said filling, of which Austin speaks, and as he directs such filling to be made.

Ans. Austin mentions two substances which might be filled in after the blocks were set and concreted with tar similar to that of Nicholson, those substances being broken stone or gravel; but refuse slate, grit, and sand would not absorb the tar, and consequently would remain in the cells or channels dry as (the witness desired the word grooves stricken out) when put in. The only way that it could be filled into those, or channels or cells, would be by first mixing it with the tar and then putting it in, and would then be a very imperfect filling, as it would be almost impossible to ram it in and form a solid mass, filling up all cracks and interstices near the bot-
434 tom; furthermore, the blocks being only glued or cemented to the foundation, they would not stand against the necessary ramming, but would be broke loose from the foundation, thereby destroying the pavement.

11th int. State in what condition the fibrous or other substances spoken of by Austin with which to fill his channels or cells must be in order to mix up with the tar or cement so as to form a concrete, and so as to carry out the purpose described by Austin in reference to the wear of his pavement.

(Objected to as assuming a condition not essential to Austin's pavement or purpose.)

Ans. The fibrous or other substances mentioned by Mr. Austin would necessarily have to be cut up or broken up into small pieces for the purpose of forming a concrete. Concrete, as I understand it, is always made from some hard substance broken up and mixed with hydraulic cement or tar, or some equivalent for the same, forming, when mixed and dried, one solid mass, capable of resisting almost any pressure or wear; the concrete must be composed of some hard substance like stone or gravel for the purpose set forth in Mr. Austin's specifications, where the wearing qualities are called into requisition.

12th int. State whether or not cotton, wool, flax, and hemp are substances known in the arts as fibrous substances, and whether or not such substances, or others of a similar character, would or would not, in your opinion, be equivalents for the filling of the cells or channels within the directions given by Austin in his specifications?

435 Ans. Cottons, wool, flax, and hemp are known in the arts as fibrous substances, but, in my opinion, would not be equivalents for the filling set forth in the specifications of Henry Austin.

13th int. If Nicholson wooden pavement, as described by him, is properly constructed, either upon the first or second methods, with ordinary mechanical skill and correctness, state whether or not the short blocks or strips could work up in the common and ordinary use of such pavements.

Ans. If Nicolson's pavement is constructed according to the spe-

cifications, with the ordinary mechanical skill, the short blocks or strips could not work up.

14th int. Are you familiar with the mode in which the Nicholson pavement has been constructed in the city of Chicago with respect to the strips between the blocks? If so, state what length of strips has been used how the same have been laid with respect to equal bearing of the entire strip on the foundation and to the crown of the street, and how the mode in which they have been laid would effect the liability of the strips to work up.

Ans. I am familiar with the construction of Nicholson's pavement in the city of Chicago; in most instances the strips have been composed of four foot pickets, some narrower and some wider, from three to four inches wide; they have been laid on the foundation irrespective of the crown of the street or the inequality of the boards
436 in full length, thereby in many places causing the ends of the strips to be considerably elevated above the floor foundation, say from one-eighth to five-eights of an inch, thereby causing the strips to act as a pry against the filling at the opposite end from the one that was elevated when heavy weights are passing over the elevated end of the strip, causing a breaking up or shattering of the filling, and allowing gravel, if any should drop from the filing by the wear of the strip, to work under the same in time, and by constant use gradually to rise to the surface and might in time work out.

15th int. If Nicholson's pavement is properly constructed upon his second method, and according to the directions of the specifications, would the strips between the rows of blocks require to be nailed to the long blocks or to the flooring, in order to prevent said strips from working up?

Ans. If Nicholson's pavement was constructed according to his second specification the strips would not require to be nailed either to the flooring or to the long blocks to keep them from working up.

16th int. Taking into consideration that Mr. Nicholson provides that in some of his modes of construction long and short blocks may be pinned together with wooden pins, and that he also provides that the strips are to rest upon the foundation or support in his second method with the superincumbent mass of filling rammed and
437 pressing upon them, state whether or not, in your opinion, the nailing of said blocks together or of said strips to the flooring when that mode of foundation was used, would or would not be a mechanical change, and as an equivalent within the directions of the patent?

(Question objected to on the ground that the question is leading, suggestive; contains a falacious and improper argument and is irrelative.)

Ans. It would be a change that would suggest itself to almost any mechanic and would only be an equivalent for the pins.

17th int. State whether or not it would be, under the Nicholson patent, a matter of mechanical judgment to determine in constructing a wooden pavement the length of the long and short blocks or strips

relatively to each other, and the consequent depth of the cells filled with gravel and tar depending upon the location and the probable prospective use of the pavement?

Ans. It would.

18th int. In the practical construction of the Nicholson pavement, to what extent, if any, is it necessary to the convenient prosecution of the work, that any portion of the blocks laid should, before such blocks have been filled, be used as a roadway, and the teams containing material to pass over, and, so far as your observation extends, state what length of unfilled blocks have thus been made use of.

(Question objected to as suggestive and irrelevant.)

438 Ans. In the construction of Nicholson pavement it is necessary for the hauling of material that teams and vehicles should pass over the blocks before being filled from the rear unto the place where the blocks are being set up. As far as my observation has extended in the city of Chicago, there have been usually from one-fourth of a block to a whole block, and sometimes as much as two blocks or streets; sometimes, on account of the lack of material, such as tar for the completion of the pavement.

19th int. State whether the Austin pavement could be constructed in that manner, and also how the Austin pavement in its completion would be effected by its construction.

(Question objected to for the ambiguous use of the word "in" before the words "its completion;" also as irrelevant.)

Ans. Mr. Austin's pavement could not be constructed in that manner, his blocks having no support previous to receiving the filling, except the glueing or cementing to the foundation, they would not be capable of sustaining the weight of vehicles or the pressure of animals feet, for the purpose of conveying the material to the advanced portion of the construction. The blocks would tip over, and when one had tipped it would cause the next one to fall, and so on through the whole pavement, and when once down it would be very difficult, if not impossible, to replace them in their original position.

20th int. How would that be if the blocks in Austin's were toe-nailed to the foundation as an equivalent for the glueing or cementing?

439 (Question objected to, on the ground that the question is ambiguous in not stating whether it inquires of the Austin pavement during its construction or after its completion; and if the former, on the ground that it is irrelevant.)

(Question amended and objection withdrawn, except as to irrelevancy.)

Ans. If the blocks were toe-nailed as an equivalent for the cementing or glueing it would be no better, for they could only be toe-nailed on one side and on one end, and they would, therefore, be liable squash down, as before, in front of the wheels of vehicles or under the pressure of animals' feet hauling said vehicles.

21st int. In a pavement constructed after the Austin description with the channels or cells reaching to the bottom of the blocks, state whether or not, in your judgment, there would be any liability

arising out of the necessary mode of construction, or in the use and travel on the pavement of the gravel or gritty particles of the filling to work under the blocks; and if so, state under what conditions, and in what circumstances, such liability would exist?

Ans. In a pavement constructed under Mr. Austin's specifications, where he uses the fine filling, more especially the tar, would not permeate to the bottom of the cells, and would, therefore, allow the sand or grit or any fine particles of gravel, even in the gravel filling, to work under the bottom of the blocks by the jar of heavy vehicles passing over the same; and furthermore, blocks glued or cemented only to the foundation would be very liable to work loose, thereby allowing the gravel and broken stone to work under them, causing a total disruption of the pavement. It is my opinion that a pavement constructed after Mr. Austin's specifications in the streets of Chicago where there is so much heavy teaming, would be liable to get canted from its vertical position, thereby allowing the filling to get under the back side of the block; the filling would immediately follow the block from its vertical position; the next block would then next take the place of the filling, and so on, until the whole pavement was destroyed.

22nd int. State whether or not this liability would exist alike in all places, and under all circumstances, in the city of Chicago; and if not, in what places and under what circumstances would it be most likely to occur?

(Question objected to on the ground of irrelevancy.)

Ans. I think it would exist alike in all streets subject to heavy travel, but more especially near bridges, or on the side of any elevation on which it might be erected; where there would be a settling in the foundation or pavement, it would be more likely to occur, and particularly at the crossings.

23d int. From your experience and general knowledge of the art of constructing wooden pavements and your observation of their use, how long would a pavement constructed upon either the first or second methods described by Nicholson last as a pavement, supposing the same to be properly constructed with ordinary mechanical skill and correctness, according to the calls of the patent. If you shall state that you have any experience in regard thereto, state what that experience is.

Ans. In my opinion, a pavement constructed after Nicholson's specifications will last in the ordinary streets of Chicago from eight to twelve years; it depends a good deal on the manner of construction. If constructed strictly in accordance with the plans and specifications, it would last much longer than if constructed in the ordinary way. In 1859, I think June, 1859, we took up some blocks out of Wells street pavement which had been constructed in 1856, if I mistake not, to ascertain how it stood if we could, for the purpose of basing our opinion on the pavement in regard to the durability of such pavement, as we wished to construct more on the same plan. We found that those blocks had diminished in length at the rate of about 1-8 and 1-16 of an inch, 3-16 of an inch for a year; they were perfectly

sound in every respect, on the morning of the 6th day of November, 1865, that is, this morning; in company with Mr. Goodwin, I visited the same block of pavement and took therefrom two blocks and a strip; they were taken from near the middle of the street, and near a large hole in the street where the pavement was destroyed. I find those blocks to average about four and a half inches in height. Those blocks are somewhat shorter than they would probably be at a distance from this hole in the street. They appear to be per-
442 fectly sound, as much so as when they were first laid in the pavement. They were taken from the first course on the side of the hole; the hole extending across the street, I think, nearly 2-3 of the way, and about twelve feet wide, where the wheels had pitched over them, and were, consequently, much more worn than they otherwise would have been. This strip or picket which had been used to form the bottom of the channel was taken from the second row, and is as perfect in every respect as when first laid down, with the exception of a crack or a break which was caused by pulling it up; the said blocks are here marked complainant's Exhibits O and P, and two strips marked Q and R. The strip marked R was taken from the first tier of blocks, one end protruding out into the hole before mentioned, by which means the upper part had been worn off considerable, but remains as sound from appearance as when laid down. Those blocks, on account of their near proximity to the hole before mentioned, have become more or less loosened from the filling, by which means water would be permitted to penetrate to the bottom and dampen the superstructure more or less; the water from the hole above mentioned, it having contained a considerable quantity through the recent rains, would also penetrate into the pavement, thereby more or less would be absorbed into the blocks. I find by
443 cutting into the blocks and strip that they are only moist and not as fully charged with water as would be a piece of pine timber immersed in the same. The blocks near the edge of the hole had canted somewhat, and the gravel from the top of the street had worked down between the strip and the blocks to the thickness of half an inch.

24th int. State what, within your knowledge, was the character and condition of Wells street upon which the pavement last spoken of was laid, and to what weight of traffic it has been subjected since so laid.

Ans. Wells street is a very low, wet street where this pavement was laid; and it was laid at the old grade, which is much below our present grade of streets. Lake street is laid to the new grade on the south of the pavement spoken of. Wells street bridge is much higher on the north, consequently the water has run down on to the pavement and kept it a great deal wetter than it otherwise would have been. The traffic on Wells street has been very heavy, it being one of our principal bridged streets and leading to the depot of the Galena railroad.

25th int. State what, in your opinion, would be the comparative durability of a wooden pavement properly constructed in all particu-

lars as described by Henry Austin in his specifications as compared with a pavement properly constructed according to Nicholson's description, having reference to the whole mode of construction
444 and the wear of each, and give your reasons for any opinion you shall express.

Ans. I think that the Austin pavement, constructed under his specifications strictly, and placed on the streets of Chicago, would not last over four years at the outside, and I have my doubts at present whether it would last two or not, for the reason that Austin's pavement, being constructed in compartments resting upon ledges or stringers, glued, cemented, or otherwise attached as per specification, could not be held in their places, for the reason that the glue or cement would be destroyed by the dampness of the ground and the traffic upon the street. I further think that the blocks, being cemented on to the foundation, would in a very short time be displaced and laying on top of the filling a heap of rubbish.

26th int. State how it would be in the last particular mentioned, if the blocks were toe-nailed to the foundation as an equivalent for the cement and glue.

Ans. As I before said, it would be no better, as it would be impossible to nail the blocks more than at one side and one end, and some of the filling described by Austin is so fine when placed into the cells or channels would be impervious to the tar, therefore would remain sand or fine gravel grit as when put in, and would form no support for the blocks, with the exception of the slight support where the tar might affect the top of the sand; if constructed and filled with broken stone or coarse gravel, it would form a better support to the
445 blocks than in the former case, but as there is no chance to ram even the gravel or stone, it would make a very poor pavement in my opinion.

27th int. State what would be the effect upon the durability of the said Austin pavement spoken of by you, in reference to the want of any prevention to moisture interposed between it and the ground, or the use of any such preventive to moisture in the preparation of the foundation itself on the underside.

(Objection to first clause of question as containing an incorrect assumption of fact.)

Ans. If the Austin pavement was constructed according to his plans and specifications, and could stand up under the traffic of the street for five years, which I very much doubt, without the prevention of moisture being absorbed into the foundation laying on top of the ground, using the phrase generally used by mechanics, "betwixt wind and water," the foundation would become rotten and totally destroyed, thereby destroying the pavement.

28th int. In about what time would such rotting take place, and in the process, what would be the effect upon the bottom of the blocks, supposing, as you have done, that they stood.

Ans. By placing boards or planks flat on the ground, after the first year they commence to rot and continue to decay, some more and

some less, but generally from one-fourth to half an inch per
446 year; it depends somewhat upon the locality; if placed where the wind don't touch them, they will rot much faster, on the account of retaining the moisture longer. I think that in this case the blocks of the street, especially when they were sappy, which was always the case with those blocks, would commence to rot, thereby letting them down with the foundation and very much injure the pavement.

29th int. Suppose they did so rot, what would be the effect of the weight of traffic on the surface in reference to the filling of said blocks?

Ans. If the blocks should rot and drive down through the filling, it would allow the wheels and calks of horses' shoes to wear off the tarry coat on the surface of the filling, thereby loosening the whole structure.

30th int. What would be the effect of driving the filling down by the weight of wheels and heavily loaded teams, the lower ends of the blocks commencing to rot as you have stated?

Ans. As I have already heretofore stated, the gravel would have a tendency to work under the blocks, should the foundation remain until after the decomposition took place in the blocks.

31st int. Suppose Austin's foundation, instead of being made of wood, was made of stone, as he describes, in what way could the blocks be secured to the stone, and what would be the effect upon the probable durability of the pavement in the respects
447 you have before mentioned, when speaking of blocks secured to a wooden foundation?

Ans. If Anstin's foundation was made of stone, I know of no other method of securing the blocks to the foundation than the one he describes in his specification; that is, glue made of crude naptha, India-rubber, and lac, boiled together, and perfectly amalgamated. I would not be understood, however, to say that it would answer the purpose in this country; I very much doubt it; should it answer the purpose, four years would be the life of the blocks set on such stone; that is to say, before they would commence to decay.

32d int. How would it be in the case last supposed, in reference to the hold and standing of the blocks?

Ans. I do not think that the effect would be varied in the case of a stone foundation from that in a wooden foundation, if the glue should be found to answer the same purpose on stone as on wood; but I very much doubt whether the glue would be found to hold any length of time on a stone foundation.

33d int. What would be the effect of the natural condensation of moisture by the stone upon the lower ends of the blocks? and if you have any experience in regard thereto, please state it.

(Question objected to, to the statement of experiences not in this case.)

Ans. The effect of condensation of the moisture from the
448 ground into the stone foundation would be the absorption of the moisture of the stone into the blocks, thereby causing the blocks to rot much sooner than on a wood foundation, I think. I

am aware that a pine post set upon a stone on the ground will be more or less saturated with water for at least one foot above the stone, and have been known to rot in a very short space of time.

34th int. Suppose Austin's pavement to be constructed upon an iron foundation, as he describes, state how the blocks would be secured, and how they would stand, and what would be the effects in the particulars you have mentioned?

Ans. If Austin's pavement were constructed on an iron foundation, as he says it may be, I know of no better method of securing the blocks to the foundation than the one suggested by him, which is glueing, unless they should be rivetted to the iron foundation. Should the pavement be so constructed with glue, as is specified, I think it would make a much better pavement than either of the other methods, could the water be kept from coming up through the joints of the compartments.

35th int. What would be the comparative utility of such pavement, constructed upon stone, slate, or iron, in reference to the economy of construction, compared with a wooden foundation, and also compared with the foundation described by Nicholson?

449 (Question objected to, first, because it is irrelavant; second, because it is ambiguous, because Nicholson describes several foundations.)

Ans. I think that slate would be much cheaper than common stone or iron; still, either of those foundations would cost greatly in advance of the cost of Nicholson's foundation.

36th int. State whether or not, in your opinion, and according to your observation and experience, if any you have, Nicholson's pavement, constructed according to the specifications contained in the patent, would wear down in the ordinary and public use of such pavement to the short blocks or strips in the usual lifetime of such pavement, or before, as a whole, it would become defective and need to be relaid; and if you have any experience in regard to the matter here enquired of, state what that experience is.

(First branch of question down to relaid objected to as leading.)

Ans. It would not. From my experience and actual measurements I have taken of wooden pavements taken up in Chicago, for the purpose of testing the wear, I find that the blocks have diminished in length not over about three-sixteenths of an inch per year.

Direct examination of the witness, Reuben Cleveland, was here adjourned till to-morrow, Tuesday, November 7th, A. D. 1865, at 10 o'clock a. m.

P. A. HOYNE, *U. S. Comm'r.*

450 Met pursuent to adjournment from yesterday, on this Tuesday morning, November the 7th, A. D. 1865, at 10 o'clock.

P. A. HOYNE, *U. S. Comm'r.*

Direct examination of the witness, Reuben Cleveland, was here resumed with 37th interrogatory.

P. A. HOYNE, *U. S. Comm'r.*

37th D. interogatory. State whether or not you find in the Nicholson invention and combination, as set forth in his reissued specification, described and set forth in the said specification of David Stead, and whether or not the pavement described by David Stead in his said specification is identical with, or different in principle from, the pavement described by said Nicholson, and give your reasons for the opinion you shall express.

Ans. I do not find the invention of Samuel Nicholson, as set forth in his specification, in the specifications of David Stead. The pavement described in the specifications of David Stead is different in principle from that described by Samuel Nicholson. Samuel Nicholson describes a pavement consisting of a foundation of tarred paper, lime mortar, or hydraulic cement, or a flooring of boards coated with tar or some other preventive to moisture, keeping in view the idea through his whole specification that water is to be excluded from penetrating through the foundation and into the superstructure. I do not find such a foundation described in the specifications of David Stead. The superstructure described by Samuel Nicholson is composed of a series of long and short blocks, so arranged, combined, and constructed as to form cells or chan-
451 nels between the long blocks, the bottom of those cells being the tops of the short blocks, for the purpose of upholding the masses of gravel and tar, which he describes for his filling as being impervious to water, thereby protecting, in connection with the coating of tar over the tops of the long blocks, the whole superstructure from the moisture from above. David Stead describes (here the witness turns to the specifications of David Stead) no foundation, with the exception of that formed by the usual grading of the street. He then claims certain forms of blocks, to be placed upon the street, all of the same length, but differing somewhat in shape and construction. He claims nor describes no coating of tar over the tops or the bottoms of the blocks. He does, however, say that the interstices between the blocks may be filled with wood, or with cement or asphalt, as may be found convenient, to within a short distance of the tops of the blocks. He, however, says: "I would recommend the cavities to not be filled up, provided the circular blocks are not too large, so as to render such cavities inconveniently large." I therefore do not find the pavement described by said David Stead to be identical with that of Samuel Nicholson in principle.

38th int. State whether or not you find in Stead the long and short blocks of Nicholson, or any equivalent therefor.

Ans. I do not find in the specifications of David Stead the
452 long and short blocks described in Samuel Nicholson, or any equivalent therefor.

39th int. Referring to figures 21 and 22, 16 and 20, of Stead's specifications, state (taking those in connection with the text) whether or not you find in those figures any inequalites of surface; and if so, how such inequalites are produced, and what is the office which they practically subserve as described by Stead?

Ans. Figure 21, represented on the plan accompanying the speci-

fiations of David Stead, is a top view of nine of David Stead's blocks, as shown by model marked Exhibit H. Those blocks are supposed from the drawings to be about five inches high; five inches high is the longest block which he describes in his specification supposed to be about six inches high, with about $\frac{1}{3}$ of the tops of the blocks cut away so as to form transverse and longitudinal grooves or channel lengthwise and across the street, and placed on the ground or road-bed in close proximity to one another, thereby forming a self-support; those grooves or channels, he says, may be filled with cement or asphalt to within a short distance of the tops of the blocks, leaving the grooves for a support for the animals' feet. He describes no coating of tar, as I before said, or any other preventive to moisture being absorbed into the blocks from either top or bottom. Figure 22 is a side view of three of the above-named blocks before being placed in the pave-

453 ment. Figure 16 is a top view of another method of constructing his pavement, as represented in complainant's Exhibit I, with five of the spaces between the blocks or interstices filled with cement or asphalt to within a short distance of the top, for the purpose of forming a foothold for the animals' feet, as before mentioned. Figure 20 is a top view of nine whole blocks and three parts of blocks of a hexagonal shape or six square. They are placed on the road-bed as before mentioned on their ends, bringing their angles together and forming triangular interstices between them; two of those joints are filled with pieces of plank set on edge between the blocks and projecting above the tops of the blocks, for the purpose of forming a foothold for the animals; those interstices are also filled with cement or asphalt to within a short distance of the top, as in the above-named figure.

40th int. State whether or not you find in the figures last described, or either of them, or in the text describing them, taken together, any analogy to the long and short blocks of Nicholson; and if so, in what respect they resemble the said long and short blocks of Nicholson, or in what respect they differ in construction or effect.

Ans. I find figure 21 and 22 to nearest resemble the long and short blocks of Samuel Nicholson in appearance, but their construction and the purposes they are calculated to subserve are entirely different. The

454 superstructure of Samuel Nicholson's pavement is constructed of long and short blocks and strips; the long blocks are placed in the pavement for the purpose of receiving the heavy travel and wear of the vehicles and animals' feet; the short blocks or strips are placed in the pavement for the purpose of keeping the long blocks at a proper distance from each other, holding them in a perpendicular position, forming joints between the long blocks and short blocks, whereby the gravel is prevented from working under the long blocks, and also forming a bottom to the cell for receiving the broken stone and gravel and tar, and holding it in its proper place, so that by the pressure of the wheel upon the top of the concrete or tarry mass, will have the effect of filling up any vacancies that may be caused by shrinkage or otherwise, and thereby preventing the water working into the joints below, which I

consider an important feature in the Nicholson pavement. Figure 21, in Stead's specification, is constructed in an entirely different manner, and as to the grooves is calculated to subserve a different purpose; the blocks, when cut from the timber, are all of one size; the top part of the block is afterwards cut away about one-third of the way down from the top for the purpose of forming grooves, both longitudinally and transversely on the street for the support of animals' feet while hauling heavy loads; those blocks are placed side by side, thereby bringing the joint in the centre of the groove
455 between the blocks; there is no joint running down vertically with the tops of the long blocks; those grooves are not calculated, especially a flooring for the support of broken stone, or coarse gravel, nor tar, as he describes no concrete of that description in his specification; they are merely, as I before said, for the support of the animals' feet, and may or may not be filled at the discretion of the parties constructing the pavement; I therefore find no short blocks for the purpose described in Samuel Nicholson. Figure 20 does not contain the long and short blocks. I find in the specifications of David Stead, in figures 11 and 13, a pavement constructed of two courses of blocks, the upper one resting upon and breaking the joints of the lower course; there is no similarity, in my opinion, between this pavement and the one constructed by Samuel Nicholson.

(Defendant objects to last clause of the answer commencing with the words, "I find in the specifications," as not called for by the question.)

41st int. State what would be the effect in the wear of such transverse and longitudinal grooves, as shown in figures 21 and 22, supposing the same to be filled with Nicholson's mass of gravel and tar concrete, and how far they would subserve the purposes of Nicholson's cells or channels, so filled in respect to the wear aforesaid.

456 Ans. figures 21 and 22, of David Stead's specifications, supposing them to be filled with the concrete of Samuel Nicholson, would be very poor pavement; heavy vehicles passing along the street would form ruts in the grooves, break off the corners of the blocks, and in a very short time would work out the filling in those ruts, and the wheels would work down to the base of the blocks, that is to the bottom of the groove, and ruin the pavement.

42nd int. State whether or not you find the invention and combination of Nicholson, as set forth and described in his specifications, described and set forth in the said specifications of Thomas Wood, the younger; whether or not the said pavement, so described by Wood, is identical with or different in principle from the pavement described by Nicholson; and give your reasons for any opinion you you shall express.

Ans. I do not find the invention and combination of Samuel Nicholson, as described by him, in the specifications and drawings of Thomas Wood, the younger; neither do I consider the invention of Thomas Wood, the younger, to be identical with or substantially the same with that of Samuel Nicholson. The manner of constructing the pavement of Samuel Nicholson has already been stated by me.

Thomas Wood, the younger, describes a pavement constructed of wooden blocks, of certain forms and for a certain pur-
457 pose. (The witness here turns to and examines the specifications of Thomas Wood the younger.) He says: "The blocks I use for paving are of two forms, namely, the section of a pyramid having either a square base, figure A, or an elongated base, figure "B," and the double wedge, cut from either a similar square base, figure C, or a similar elongated base, figure "D." I confine myself to no particular dimensions for the blocks, neither to any particular angle, only the sections of pyramids and the double wedges must all be cut at the same angle." He says again: "The peculiar construction, combination, or arrangment I adopt is as follows: I dispose the blocks so that every other block in one series of blocks is a section of the pyramid standing on its small end, figure E, and every other block in another series of blocks is a section of a pyramid standing on its base, figure F; the intervenning blocks of both series, aaaaa, are double wedges, which, from their peculiar form, combine equally well with the sections of pyramids, whether these latter be placed on their smaller end or their base, and a number of such alternate series of blocks being placed across the road; all the blocks are made to lean and press on each other on all sides in mutual support, figure G." He then describes half blocks for filling up near the curb walls, wherever necessary;
458 he also describes keys or wedging blocks in the centre of the pavement, for the purpose of keying the pavement together; in another description of his pavement, he leaves the section of pyramids with their bases elevated slightly above the balance of the blocks, so that when the pavement is laid down it may be keyed to any intensity, evidently calculating the blocks to form a regular arch, self-supporting, over the road-bed, thereby doing away with all necessity of a foundation, as he describes no foundation, but says it may be laid on mere shingle or gravel. The word shingle in this case is nothing more nor less than beach gravel. The model Exhibit K, complainant's is a fac-simile of the figure K, of the specification of Thomas Wood, the younger; it is composed of alternate rows of blocks, one row being somewhat shorter than the other, say from three-quarters of an inch to one inch, and placed transversely across the street; those grooves are formed for the express purpose of forming a support for animals' feet. Exhibit "M" is one modification of his pavement, as laid down in his specifications, composed of long and short blocks, the long blocks being the sections of pyramids placed with their base upwards; the grooves in this exhibit are in-
459 tended to represent a pavement where the groove is three inches deep, or one-half the depth of the blocks. Those grooves, he says, may be filled. "I then fill in the spaces c c c between the alternate series with concrete or coal tar, ashpalt, or other bituminous substance, heated and mixed with gravel, sand, or such like material." I therefore do not consider the pavement described by Thomas Wood, the younger, as identical with, but widely differing from, that of Samuel Nicholson in principle and con-

struction, for the reason that Mr. Wood describes no foundation calculated to form a support for the blocks, nor a preventive to moisture from either below or above, with the exception of what moisture might be prevented, if any there should be, by filling of the grooves.

43rd int. State whether or not you find in the Wood specifications a special form of blocks, as an essential element of his combination, and for a special object and purpose described; if you shall say you do, state further whether or not you find that element in the Nicholson combination, or whether or not you find in the latter a different form of the blocks, new as to Wood's patent, and a substantial departure from Wood's special forms, resulting in new effects. If yea, state what those effects are in reference to the practical use and operation of the pavement, and also in reference to the facility and cost of construction; and in this connection state whether or not you find a practical benefit effected by Nicholson in his combina-
460 tion, and if so, whether or not you regard these new forms combined by Nicholson with such new results as constituting a difference in principle between Nicholson's combination and the construction found in Wood.

(Defendant objects to question as leading and suggestive, and calling for irrelavant testimony.)

Ans. I do find in Wood's specification a special form of blocks for a special purpose. I do not find the form of block in Wood's specification in that of Samuel Nicholson. I find in the latter entirely a different form of block, new as to Wood's patent, and resulting in a different effect. I find them new in this effect: the long and short blocks when combined rest upon a support or foundation, as described by Samuel Nicholson; they are not formed so as to be self-supporting in any way, but when completed and filled with the concrete, as described, form a superstructure in my opinion far superior to any construction that could be formed with Wood's blocks; it is constructed with a great deal more facility and ease, and at less than half the expense for labor. Wood's pavement, when constructed according to his specifications, would be a very poor pavement, more especially when constructed after the method shown in Exhibit M. The blocks at the edge of the grooves being cut away at an angle, project over the short blocks after being filled with the concrete, which, I think, according to the reading of
461 the specification, is to be mixed before putting into the street; it would be almost impossible to fill it in solid around the angles of the blocks before the concrete would get cold, and after it was cold, would be entirely impossible; the wheels would have a tendency to break off, and split off the fibre of the blocks at the top, thereby loosening the concrete and allowing it to work out; and again, those grooves running lengthways of the street, wheels of vehicles would form grooves between the blocks, work out the concrete, and destroy the street; if that was not the case, it would drive out the short blocks from the bottom of the long ones, settle them into the shingle or gravel, and ruin the street in a very few days. Exhibit K, of figure K, would make a better streetthan the one last men-

tioned; but still the double-wedge blocks, in this figure, would have same effect partially, they being all placed with the base downwards; if the vehicles passing over the street could be always driven so as to rest upon the long blocks, or the sections of pyramids standing on their smaller ends, it would have a better effect, but still in my opinion it would make a very defective pavement. I find a practical benefit over the Wood pavement, in the Nicholson blocks, as described by him. I do find a new form in Nicholson, as constituting a difference in principle between the pavement constructed by him and that of Mr. Wood.

44th int. State whether or not you find the invention and
462 combination of Nicholson, as set forth and described in his reissued specifications, described and set forth in the specification of John Perring; and whether or not the pavement, so described by Perring, is identical with or different in principle from the pavement described by said Nicholson; and give your reasons for any opinion you shall express.

Ans. I do not find the pavement described and set forth in the specifications of Samuel Nicholson described and set forth in the specifications of John Perring; neither do I find it identical with but different from the pavement described by Samuel Nicholson, and different in principle from ——. The pavement of Samuel Nicholson, as heretofore described, is composed of a certain foundation for the purpose of support of the blocks and the prevention of moisture, and the superstructure is composed of long and short blocks, and with a certain concrete or filling, which has been heretofore described. John Perring, in his specifications, does not describe any foundation in particular, but he says: (here witness turns to the speccifications,) "when the blocks are to be laid upon a concrete or other artificial substratum in a place where the traffic is considerable, I make them (meaning the blocks) six inches in depth, and the pins or pegs not less than one inch in diameter." That is the only reference that he makes to a foundation in his specifications, meaning, no doubt, in my mind, to speak with regard to a prepared roadway that has been filled in with earth, or otherwise concreted, over some damp or wet
463 place, to form a better support for his superstructure. The blocks of John Perring are construced in an entirely different manner from those of Samuel Nicholson, and calculated to subserve another purpose, being when laid down on the street somewhat self-supporting by means of overlapping one another; they are constructed with slips of wood inserted between them, extending to within one inch of the top and bottom of the block; those slips are held to their place by pins or pegs passing through them in the centre of each block. It is further stated in the specification, that the holes in those slips shall be somewhat larger than the pins, for the purpose of allowing the blocks to conform to the crown of the street; there is no tarry coating placed over those blocks, for the purpose of excluding the moisture, as in Nicholson's specifications, nor any concrete composed of broken stone, gravel, and tar, for the purpose of filling the grooves between the tops of the blocks and those

slips; neither does he intend any filling, because he places those slips at an equal distance from the top and bottom, so that when the pavement becomes worn on the top, it may be turned over bottom side up, and used again as before. Therefore I do not consider the pavement constructed by John Perring to be the same in principle of the one constructed by Samuel Nicholson, but widely different, much inferior, and more costly.

45th int. State whether or not you find in said Perring's
464 specifications the long and short blocks described by Nicholson, the cells described by Nicholson, or the filling in the cells, or any equivalent for either of them.

Ans. I do not find the long and short blocks in Perring, nor the cells or the filling which is described in the specifications of Samuel Nicholson, or any equivalent for the same.

46th int. What is the office of the slips of wood described by Perring.

Ans. They are inserted between the blocks for the purpose of holding them apart, and forming a foothold for the animals of burden.

47th int. State what substances would be called for to be used in the place of the wooden slips described by Perring, under the phrase, other elastic substances, page 5, line 13, as equivalents for the wooden slips, having reference to the directions given by Perring, and the purposes and objects to be subserved by said slips, as specified by Perring.

Ans. I do not know of any substance that could be used for the slips that would answer the same purpose of the wooden slips, neither do I think that the patentee knew of any other substance as an equivalent for the same, for, as he says on page 5, commencing with line 26, "It is desirable that in these slips the fibre or grain of the wood should run horizontally, and it will be generally found that they can be made from the comparative waste material, formed in squaring the wood in the manufacture of the blocks, by which
465 a considerable saving can be effected in the cost of the wood pavement." I am also aware that the patentees, in making out their specifications, cover all of the ground and take in everything that would be an equivalent for the part of the invention they are about to describe, and I think it was in this way that he included this fibrous substance that he speaks of.

(Defendant objects to the last clause of the answer commencing with, I am also aware, as not called for by the question.)

48th int. Suppose that the substances of cork or raw India rubber were used for these slips in Perring, state what would be the practical effects of such use, having reference to the directions given by Perring, of which you have spoken, that the slips are hung on wooden dowles or pins, with holes sufficiently large to admit of such play as that the mass or slab would in use conform to the curve of the street, and also whether or not, when so constructed, water would be prevented from passing down from the surface of the pavement to the bottom?

(Question objected to as leading, suggestive, misstating the witness, and as irrelavant.)

Ans. If cork was used for those slips when damp or wet, it would join together by draft of animals allowing gravel and dirt to get under the pavement, and when dug would break very easily,
466 and thereby destroy the pavement. If cork could be procured in sufficient quantity and size for the construction of the slips, which I very much doubt, with regard to raw India rubber it would not answer. A very short time of a hot sun upon it would destroy the rubber; and furthermore, would cost exceedingly high. By such slips, composed of the aforementioned materials, the water would not be prevented from passing down through the pavement in the least.

49th int. How would it be in the last particular stated, suppose the pavement to be constructed with wooden slips in the manner described by Perring?

(Question objected to as improper and irrelevant, and as improperly referring to the last question or answer.)

Ans. It would be no better than in the above cases.

50th int. State whether or not you find the said invention and combination of Nicholson described and set forth in the said specifications of Joseph Crannis and Robert Kemp, and give your reasons for any opinion you shall express.

Ans. I do not find the invention and combination of Samuel Nicholson described and set forth in the specifications of Crannis & Kemp, for the reasons heretofore stated by me with regard to the properties of the foundation and superstructure of Samuel Nicholson, as set forth by him in his specification, whereby he sets up the exclusion of moisture from below and above by certain preven-
467 tives by him described. Messrs. Crannis & Kemp describe a foundation constructed by laying down two rows of plank lengthwise of the street, near the curbstone, and then placing other planks across the street, interlocked at the ends by a double bevel, and leaving spaces between the edges of the plank for the purpose of allowing the water to pass through, thereby evidently intending their foundation to form nothing but a support for the blocks. (Here witness refers to the specifications.) Witness resumes: They say "secondly, our invention consists in certain improved forms of blocks, or improved combination of blocks of known forms for wooden paving, which may be used either with or without such foundation; but all, excepting as is hereinafter excepted, have for their especial object the affording a sure footing for horses in all weathers and under all diversities of local circumstances." They go on at page 3, line 31: "The blocks are of a parralogramic form, and of two different sizes in point of heighth and thickness, and they are laid with the grain of the wood in a vertical position, in rows, side by side, in such manner that the high and low blocks alternate in each row, and the high blocks of each row are opposite the low blocks of the adjoining row, whereby a surface is produced having an equal number of raised and sunken parts, the former of which form so many points of support to the feet of horses, as well
468 sideways as well lengthwise. In their specification they do not set up any preventive to moisture from below being

absorbed into the blocks or any filling composed of broken stone, or gravel and tar, or any coating of the blocks whatever; neither do they claim any short blocks for the purpose of forming cells to receive such filling; therefore I consider the two pavements to differ widely in principle and construction, one from the other.

(Objection to last clause, as not responsive to question, and as not called for.)

Witness desires to add that there is another foundation similar in construction to the other, but not the same; does not differ in principle at all from the other.

(Objection renewed.)

51st int. State whether or not you find the said Nicholson invention and combination above described in the said specifications of Richard Love or William Grimman, respectively.

Ans. I do not.

TUESDAY, *Nov. 7th*, 1865, at 4. p. m.

Direct examination closed and witness tendered to defendant, and cross-examination opened in behalf of the defendant by Edward Martin, esq'r.

P. A. HOYNE, *U. S. Comm'r.*

First cross-interrogatory. Please to make a rough diagram which shall illustrate the several points of your explorations on Wells street.

Cross-examination of witness, Reuben Cleveland, was here adjourned till to-morrow, Wednesday, November 8th, 1865, at
469 9½ o'clock, without answer being made to first cross-interrogatory, the same requiring time for witness to answer.

P. A. HOYNE, *U. S. Comm'r.*

Met pursuant to adjournment this (Wednesday) morning, November 8th, A. D. 1865, at 9½ o'clock. Cross-examination resumed of the witness. Reuben Cleveland present.

P. A. HOYNE, *U. S. Comm'r.*

Answer to 1st cross-int. I have prepared such diagram of the several points of my explorations on Wells street, and produced the same, which is marked Exhibit "S" of this my deposition.

[Here follows drawing marked page 469.]

Cross-int. 2nd. What was the foundation of that pavement at Wells street? and if of boards, were they tounged and grooved, or merely placed side by side without being fastened to each other?

Ans. I did not notice at the time we took up those blocks and strips what the foundation was. I merely saw this morning, when I went there for to measure the hole for the purpose of making the aforesaid diagram, boards sticking out, which appeared to be the foundation. Whether they were matched together or not I do not know.

Cross-int. 3rd. Do not the strips produced by you, as Exhibits Q and R, indicate that the concrete or some part of the filling adhered to the top of the strip.

Ans. I should think it does. I find the mark of the stones or gravel on top of the strip, and I also see now one stone or piece of gravel adhering to the top of the strip.

Cross-int. 4th. Had those strips or either, and which of them, worked up or out of place when you first discovered them
470 on the occasion referred to in your direct testimony?

Ans. They had not worked up, but remained on the foundation solid, and had no sand or gravel under them at the time of any consequence. The blocks had been tore away from one end of the strip, marked "R," which allowed the wheels and feet of animals to wear upon the east end of the strip, and had worn it down about half the width of the strip, the strip still remaining in its place and firm upon the foundation.

Cross-int. 5th. How were such strips fastened to the blocks or foundation originally?

Ans. I did not discover any fastening of the strips to the foundation, with the exception of what might be produced by the side-pressure of the blocks and the filling.

Cross-int. 6th. What is the length of such strips respectively, and are they not straight upon the bottom and not curved?

Ans. The strip, Exhibit "R," is three feet ten inches in length, and Exhibit "Q" is four feet and a half an inch in length; they are both straight on the bottom, and not curved.

Cross-int. 7th. When you cut into the blocks, Exhibit "O" and "P," in your direct examination, to examine whether they were moist or not, how far below the tar did you cut into the sides of the blocks?

Ans. I think I did not cut any, of any consequence, below the tar.

Cross-int. 8th. How far had the tar upon the side of block "P" penetrated into the wood?

471 Ans. In cutting into block "P," I found a good coating of tar on the outside, and as far as I cut into said block I could see the traces of the penetration of the tar, about one-eighth and a sixteenth—about 3-16 of an inch.

Cross-int. 9th. When you made the examinations of pavements referred to, in company with one of complainant's solicitors, as mentioned in your direct testimony, were either of the defendant's solicitors present, or notified of the intention to make such examination, or was any person, on behalf of the defendant, and if so who, so notified or so present?

Ans. There was no person present in behalf of the defendant, to my knowledge; neither was any person notified to be present on behalf of the defendant, to my knowledge.

Cross-int. 10th. Are there no other fibrous substances known or used in the art of building or the construction of pavements, except cotton, flax, hemp, or wool?

(Objection to question by complainants, that it assumes they are used in the construction of a pavement, there being no proof it.)

Ans. I know of no other fibrous substance being used in the construction of pavements, with the exception of wood; cotton, wool, flax, and hemp I have never known to be used in the construction of pavements, neither do I think they would answer the purpose.

Cross-int. 11th. Did you superintend the paving of Clark street, to which you referred in your direct testimony?

472 Ans. I was city superintendent at the time Clark street was paved from the south street line of Washington street to the north street line of Polk street, about half a mile. I made it a practice to go on to the work as often as twice a day, for the purpose of ascertaining if the work was progressing in a proper manner, and also for the purpose of pulling out any blocks that I saw was dozed or dry-rot, or anything of the kind.

Cross-int 12th. Who was the contractor? and was the pavement constructed according to the directions, and either and which of Nicholson's methods?

Ans. The contractor was John McBean. The contract was made under the superintendence of Mr. N. S. Bouton, before I entered upon the duties of superintendent of public works, which contract specified the manner in which the street was to be curbed, filled, and paved. The pavement was constructed according to the specifications laid down in Nicolson's reissued specifications, second method, with the exception that it was not as thoroughly tarred as it should have been.

Cross-int. 13th. Were the strips fastened to the foundation before the filling was put in? if so, how?

Ans. The strips were not generally fastened to the foundation; sometimes they found it necessary to drive in a nail or two for the purpose of holding the blocks to their places, where they happened to be sawed bevelling and had a tendency to cant over, or

473 someting of that kind; it might have occurred in two or three strips in a row, more or less.

Cross-int. 14th. What was the length of those strips? and were they straight or curved at the bottom?

Ans. The strips when brought on to the work were what were called four-foot pickets. The express instructions to the men and foreman was to see that the pickets or strips had an equal bearing on the foundation the whole length, and if not, to cut such pickets until they would. It was always necessary to cut the pickets into short pieces at the gutters, and where they had not that bearing, they were cut, so far as I know. Those were my orders strictly; but I can't say that they were carried out always in my absence.

Cross-int 15th. What was the foundation? and if of wood, were the boards matched or otherwise fastened to each other?

Ans. The foundation was made of common boards, neither matched nor fastened together in any way, but were laid down of the surface of the street, clear across the street, fitting as closely as possible together, and the two centre boards sprung in, for the purpose of making as close joints as possible.

Cross-int 16th. Have you any experience as to whether moisture will be absorbed, in any material quantity, through slabs of granite

or of slate or of hydraulic cement of sufficient thickness to constitute the support for a wooden block pavement like Austin's?

Ans. I have no experience with the granite stone, but I am
474 aware that such stone as we are using in this city will absorb moisture through it into and up through a post, or condense the moisture so that a post standing upon the top of a stone will be saturated with the moisture a considerable distance up from the stone. (The stone referred to is a limestone, such as is usually termed in this city Athens marble.) As to slate, I am not well enough acquainted with it to judge. Hydraulic cement, put on good thickness, say three inches, will exclude moisture to a great extent.

(Defendant objects to so much of the foregoing answer as relates to the limestone called Athens marble, as not called for by the question.)

Cross-int. 17th. At the time of the filing of the specifications of Thomas Wood, the younger, was not a concrete foundation brought to a surface, either by a fine concrete or asphalt, a part of the art of constructing wooden pavements in England?

(Complainant objects to question, as irrelavant and immaterial, as calling for evidence not within the issues in this case.)

Ans. At the time of filing the specifications of Thomas Wood, the younger, I am aware that roads were constructed in England, and also by the Romans, being composed of concrete; and in some instances thin layers of asphalt has been placed on those roads, as I understand it, for the purpose of giving them a smooth surface; but whether ever any wooden pavements were constructed on those roads or streets I am not informed. William Grimman, in his specifications,
475 says: "I also propose to lay these blocks," specifying a certain kind of blocks, "on a concrete foundation, brought to a smooth or level surface, either by a fine concrete or on a thin layer of asphalt, or by laying thin slabs of wood on the concrete."

Cross-int. 18th. In the construction of the roads you last referred was it not a part of the method to first excavate the soil to some, and to what, extent, and for what purpose? and, in this connection, describe, as concisely as you can, how the old Roman roads were built.

Ans. I know very little of the methods of constructing those roads, only what I have read, never having seen one. What I have gathered from history in regard to those roads, it became necessary in some places to excavate more than at others; but in nearly every instance the surface-soil was excavated to the depth of a foot, or thereabouts, the width of the road; that excavation was then filled in with broken stone. The lime mortar or hydraulic cement they used for the purpose was then mixed to a proper consistency, and then poured over the stone and into the interstices, making it a solid mass or stone road—the cement being much harder than any cement can be made at the present day.

Cross-int. 19th. Please to examine the forms of the blocks in defendant's Exhibit T, to this your deposition, now shown to you, and also the mode in which they are arranged, and state whether you find

any such form of block, or any such arrangement of the blocks, in figure 23, shown in Stead's plan, annexed to his patent specifications.

Ans. I have examined Exhibit T, and find they are sub-
476 stantially the same as the blocks represented at figure 23 in the drawing attached to David Stead's specifications.

Cross-int. 20th. Is not Nicholson's filling the only preventive to moisture to the sides and ends of his long and short blocks?

Ans. Nicholson's filling and the tar placed on the foundation or other foundations claimed by him in connection with the surface coating, is the only preventive to the moisture, being absorbed into the blocks.

Cross-int. 21st. In constructing Nicholson's pavement by his second method, how closely are the blocks stood end to end?

Ans. Nicholson's blocks, when placed on the street, the ends butt together as near as they can be placed with despatch by the man; thus constructing the pavement on the surface or crown of the street, the end-joint will be somewhat open at the top, while in the gutter, at the sides of the street, it will be open at the bottom more or less.

Cros-int. 22d. What's the crown of the streets in Chicago?

Ans. From ten to eighteen inches, the street being a sixty-six foot street, the street from curb to curb being thirty-four feet wide; the crown used to be more than it is now—considerably more than it is now—but in 1859 we reduced it to ten inches in some instances.

Cross-int. 23rd. What is the width of block usually employed in Chicago?

Ans. The blocks vary in width according to the width of the plank from which they are cut; from eight inches to 12 inches, I should say.

Cross-int. 24th. Is Stead's filling limited to any particular
477 kind of cement?

Ans. I suppose if there is more than one kind of cement, he could use it.

Cross-int. 25th. Is Nicholson's bituminous filling impervious to water?

Ans. Nicholson's filling, constructed according to his specifications, I think, would be perfectly impervious to water.

Cross-int. 26th. May not the long and short blocks in Wood's specifications be arranged upon the method shown in the figure "G" of the plan annexed thereto; would not that method, or some other and what arrangement, permit the blocks to stand aranged both transversely and longitudinally, so that the long and the short blocks shall be arranged alternately in each direction, leaving cavities between the long blocks, each of such cavities being bounded by the four of the larger blocks and having its bottom formed by one of the shorter blocks; the upper ends of the long blocks, when thus placed together, presenting a checkered or tesselated appearance, and exhibiting the open spaces arranged in a similar way without doing violence to Wood's specifications?

Ans. Figure "G" of the specification of Thomas Wood, the younger, shows a plain surface, but according to the specifications Wood's long and short blocks, as shown on figure H, break their

joints the same as in figure G. In defendant's Exhibit "B," Bond's deposition, they may be arranged so as to bring four long blocks surrounding a short block, the top of the short block forming the bottom of the cavity and presenting a tesselated appearance,
478 without doing violence to Wood's specifications; but it is nowhere so exhibited by his plans accompanying his specifications.

Cross-int. 27th. Do the words dowells and wooden pins mean the same thing?

Ans. They do mean the same thing; a wooden pin is a dowell when inserted into two blocks.

Cross-int. 28th. Suppose a Nicholson pavement constructed in all respects according to the directions of his reissued specification, except that there was no preventive to moisture being absorbed by the blocks from below, except what might flow from the filling and top coating, and no solid artifical support and foundation beneath the blocks, and that the blocks were merely dowelled together with wooden pins from block to block, and that they stood upon the surface of the ground, would such a pavement, so constructed, be substantially different in principle from Nicholson's combination in his reissued specifications, under his reissued specification, in anything else than its want of a preventive against moisture being absorbed by the blocks from below?

Ans. A pavement, constructed in the manner set forth in the foregoing question, would be a Nicholson superstructure, leaving off two most important qualities of his pavement, namely, the preventive to the absorption of moisture from below and the foundation or support for the superstructure; and it would also be substantially
479 different in principle.

Cross-int. 29th. I intended to ask you whether it would be substantially different in principle without reference to the moisture point, which is intentially excluded from the question.

Ans. It would not. Nicholson specifices that the blocks may be pinned together for the purpose of forming a support and for the purpose of keeping the blocks from being forced below.

Cross 30th. Do you mean that the pins in that case are to answer the purpose of the supporting principle in the solid foundation?

Ans. I do; but still I think it would not be as good a support as the foundation specificed by him.

Cross-int. 31st. Is not the question of the order of putting in the filling, that is to say, whether the tar and gravel is mixed first and then poured in, or the gravel is put in first and then the tar poured over it, a mere matter of detail in the construction and a matter of mechanical judgment, and might not gravel or stone be first filled in to the Austin pavement and to the Wood pavement, and then the tar be poured over it in some such way as is done in constructing Nicholson's pavement, without doing violence to the several specifications of Wood and Austin respectively?

Ans. As regards the Austin pavement, he specifies that the broken stone, broken slate, grit, gravel, sand, or other fibrous substance to be first filled in, and then be cemented together with liquid, lime, or

cement poured in, or with pitch, or lac, or India rubber; but
480 with regard to the Wood pavement, the statement is different; he says, I fill in with concrete or coal tar, asphalt, or other bituminous substance, heated and mixed with gravel, sand, or such like material. I, therefore, suppose that it is his intention to first mix the tar and other ingredients together, and afterwards place it in the pavement. I believe, according to the reading of this patent, (Wood's patent,) that a man would be travelling outsides of it, unless he constructed the pavement and filling according to the specifications, although he does not claim any filling in the claim of the patent. Still I think it is in reality a mechanical change and a matter of detail in construction.

Cross-int. 32d. May not the cells or cavities, which you say may be formed by Wood's blocks, be from three to four inches deep and filled with gravel concreted with tar, without a substantial departure from his specifications?

Ans. Wood says in his specification that the short blocks may be from one to three inches shorter than the long blocks; and therefore cells three inches deep would not be a substantial departure from his specification; they might also be filled with gravel concreted with tar.

Cross-int. 33d. Could Nicholson's pavement be constructed with blocks, cut an angle of 89 degrees, part pyramids and part double wedges, if they were so arranged as to fit each other, all being cut at the same angle, so placed as not to leave open spaces between the blocks?

481 Ans. There could be a pavement constructed in that manner, but it would not be Nicholson pavement, because he does not claim blocks cut to any particular angle.

Cross-int. 34th. If they were so cut, and the pavement was in all other respects constructed strictly according to Nicholson's reissued patent specifications, would such pavement so constructed be such a substantial departure from Nicholson's pavement as to be outside of his combination?

Ans. I think it would; it would be a Nicholson pavement with Wood's blocks.

REUBEN CLEVELAND.

Subscribed and sworn to by the said Reuben Cleveland, his deposition having been read over to him carefully before signing, this 8th day of November, A. D. 1865.

P. A. HOYNE.

MONDAY MORNING, *November the twentieth, A. D.* 1865.

Examination of witnesses on behalf of the complainant was resumed, pursuant to notice, at 10 o'clock a. m.

P. A. HOYNE, *U. S. Comm'r.*

Samuel S. Greely, called on behalf of the complainant, and the said witness, Samuel S. Greely, having been by me first duly cautioned and sworn to tell the truth, the whole truth, and nothing but the truth in the cause aforesaid, did thereupon testify as follows:

Int. No. 1. State whether the Nicholson pavement on South Wells street, between South Water and Lake, laid by you, as stated in your former examination in this cause, was all laid at one time or
482 otherwise? and if laid at different times, state, as nearly as you can, the time at which each portion was laid.

(Question objected to by defendant as irrelevant in rebutting.)

Ans. The north half of the block, from South Water street to the alley, was laid in October and November, 1856; the south half, from the alley to Lake street, was laid in July, 1857.

Int. 2. Has there been any difference apparent in the wear of the two sections? and if so, do you know any reason for any such difference? If yea, state the same fully.

(Objected to as irrelavant in rebuttal.)

Ans. The north half of the block was worn the best. I think the difference is partly owing to a difference in the quality of the lumber used for the blocks. The north half was laid with blocks from freshly cut plank. The south half was laid with blocks cut from plank very thoroughly seasoned. I think green plank are better for the pavement than fully seasoned plank.

Int. 3d. State in what condition said north half now is, and how much longer apparently that portion can be used for the travel of said Wells street?

Ans. It is still in tolerable condition; and, I think, may last two or three years longer.

Int. 4th. State, if you know, what has caused the hole in said pavement about the centre of the block and south of the alley?

(Question objected to as irrelavant in rebuttal.)

483 Ans. It seems to be caused by a settlement of the ground under the boards. I find there a deflection in the board flooring of four to five inches from the horizontal line in a space about ten feet long, and the boards spring under the tread as if imperfectly sustained by the ground beneath.

Int. 5th. Did you put in a bid in May, 1865, for the pavement on South Wells street, in pursuance of the proposals of the city for such paving? If so, what modes of construction did your bid cover?

(Question objected to, to witness giving any portion of the contents of a written instrument.)

Ans. I did so bid. My bid covered three modes of paving. First, the mode usually known as the Nicholson pavement; second, for a mode similar to the Nicholson pavement, except that the picket or strips between the rows of the block to be omitted, and the whole space between the rows of blocks was to be filled with gravel and tar to the full depth of the block. The third mode was for the Nicholson pavement, but the city was to furnish the tar or composition, the contractor apply it.

Int. 6th. What knowledge, if any, had you when you put in said

bid that the board of public works had decided to adopt the Nicholson method?

(Objected to because the question assumes that the method adopted by the board was the Nicholson method, which is not, in fact, correct.)

484 Ans. I had no such knowledge.

Int. 7th. State whether or not the board of public works had, to your knowledge, given any notice that they would adopt the Nicholson second method before the various bids were handed in and opened.

(Question objected to as leading.)

Ans. They had not, to my knowledge, given such notice; they told me that the decision as to the mode to be adopted would be made after the bids were received, and that bids must be made for the three different modes.

Int. 8th. State what, if anything, had taken place within your knowledge which affected the right of the board to accept any of the bids which were offered for either mode for laying said pavement named in said paoposals or bids; had you any conversation with any member of the board of public works in relation thereto after said proposals were made by the city, either before or at the time said bids were put in? if so, state the same fully.

(Question objected to, to first clause of question as being a legal conclusion from the witness, and to the balance of the question as irrelavant.)

Ans. I know of nothing which had so happened. I had a conversation with the board of public works, with Messrs. Gendele and Letz, members of said board, at that time. I am speaking of the time mentioned in the question, that is, after the time of advertise-

485 ment by the city, and before the proposals were put in. I urged them to decide upon the mode of pavement to be adopted before receiving the bids, on the ground that the making of three bids for the same piece of work would be troublsome and embarrassing to contractors, and would lead to conflicting claims for the job after the award. Messrs. Gindele and Letz retired to the board-room for consultation, as I supposed, after which one of them came out, Mr. Gindele, I think, into the hall or the next room, where I was waiting, and said we must receive bids for the three modes, and shall decide which one to adopt after the bids are in. I told him that I presumed the board knew the relative advantages of the three different modes then as thoroughly as they would know it the next day, and still urged an immediate decision. He replied that the board had advertised for bids for the three different modes, and that they must receive bids according to their advertisement. I am not perfectly positive that it was Mr. Gindele. The previous conversation was with both of them. The last conversation was with one of them, either Mr. Gindele or Mr. Letz.

9th int. Did you have a conversation with David L. DeGolyer in relation to a controversy as to your share or proportion of the interest or special damages in a contract for paving with the city under a

license from you under said Nicholson patent, at the time you held an interest in such patent, and prior to the institution of your
486 suit against him? and did said DeGolyer in said conversation state that if you insisted on or demanded the same, he, said DeGolyer, would have his revenge if it took ten years, or words to that effect?

(Question objected to as leading, as irrelavant, as put without any proper or sufficient foundation.)

Ans. (Question withdrawn.)

Int. 10th. Did you have a conversation with David L. DeGolyer in relation to a controvery as to your share or proportion of the twelve per cent. interest or damages due on deferred payments on said paving, which had been retained or was proposed to be retained for you by the comptroller in a contract for paving from the city under a license from you under said Nicholson patent, and prior to the institution of your suit against said DeGolyer. And did said DeGolyer, in said conversation, state that if you insisted on or demanded the same, he, said DeGolyer, would have his revenge if it took ten years, or words to that effect?

(Question objected to as leading and incorrectly assuming facts not proved in or material to the case; also as asked without any proper and sufficient ground, and as irrelavant and calling for hearsay testimony.)

Ans. I had such a conversation with Mr. DeGolyer in the early part of the year 1861, and before the institution of the suit alluded to, Mr. DeGolyer having learned from the comptroller that my
487 proportion of the twelve per cent. damages on delayed payments under the assessments for paving Lake street had been reserved for me by the comptroller, in accordance with my license to DeGolyer, came to my office at the time spoken of and demanded that I should relinquish my claim to the amount so reserved for me, and should give him an order on the comptroller for the same. I refused to do so, on the ground that this was a part of the consideration for DeGolyer's use of the patent on said street, and belonged to me as much as the balance of the sum stipulated to be paid me by him. Mr. DeGalyer became very angry at my refusal, and at the close of the conversation said, in an excited manner, that he would have his revenge for this if it took ten years to get it.

(Defendant objects to so much of the answer as commences "having learned of the comptroller," down to the words "my license to DeGolyer;" also commencing with the words, "on the ground that this was part of the consideration," down to the words "stipulated to be paid me by him," as not called for by the question, and also to the whole answer generally, as irrelevant.)

Int. 11th. In whom was the control of the said Nicholson pavement for Chicago at that time vested?

(Objected to as irrelevant and calling for a legal conclusion.)

Ans. In me.

Int. 12th. State what public streets in the city of Chicago have been paved, or are in the course of being paved, with the Nicholson pavement since your last examination.

488 (Objected to as irrelevant, and as improper in rebuttal.)

Ans. The following are in process of construction at present: Wabash avenue from Lake street to Twenty-second street, South Water street from Michigan avenue to Wabash avenue, South Water street from Clark street to South Franklin street, Michigan street from Clark to Cass street. Those which have been finished are as follows: Wells street from Madison to Van Buren street, and Wolcott street from Michigan street to the north approach of State street bridge, Dearborn street from Madison to Monroe street, which has been completed.

Cross-examination.

By Edward Martin, esq.:

1st x cross. Are you acquainted with the complainant in this suit? If so, when and where did you make his acquaintance?

Ans. I am acquainted with Mr. Nicholson. I made his acquaintance in the year 1855, in the city of Boston.

2d x cross. Did you at that time commence any business with him? If not, when did your business relations commence with him, particularly with reference to the subject of his pavement?

Ans. Mr. Nicholson at that time gave me permission to lay a piece of pavement in Chicago, as a trial, or specimen, whenever I should get a contract for doing so. My contract with him for the use of the patent in this city was made in the fall of 1858. These things are the first of my business connection with him.

3d x cross. Have you not been at some time, when, and how long, the agent of the complainant in reference to his pavement?

489 Ans. I have had no special or direct agency from Mr. Nicholson in the matter; but am very frequently written to and consulted as to its cost and mode of construction, with reference to its introduction into cities.

4th x-int. Have you not acted as his general agent in reference to this pavement?

Ans. Only so far as giving information in regard to it, and in effecting two sales of patent rights. They were not special but general, and in those cases parties have requested me to obtain the right from Mr. Nicholson for them.

5 x-int. Have you not been employed Mr. Nicholson as his agent?

Ans. I have not.

6 x-int. Have you had any pecuniary interest, directly or indirectly, in the two matters last referred to by you?

Ans. In one of them I was paid a fee or commission; in the other I had no interest at all, and was paid nothing.

7 x-int. Have you not acted as the agent of Mr. Nicholson at St. Louis in relation to this pavement?

Ans. Only during the five years from 1858 to 1863, during which I had an exclusive contract for the use of his patent there.

8th int. Have you not acted as the agent of Mr. Nicholson in reference to laying his pavement at the new stock yards here?

Ans. I have not.

9th x-int. Have you not exerted yourself to introduce Nicholson's pavement since 1863?

Ans. Only so far as giving information in regard to it, and expressing a favorable opinion of it when called on, or written to in relation to it.

490 10 x-int. Have you not frequently conversed or corresponded with Mr. Nicholson upon the subject of his pavement and your suit with DeGolyer, and of his suits with the city of Chicago, since 1863, or upon some one, or one, and which of those subjects?

Ans. I have written him occasionally, but not frequently. I do not remember now the particular subjects of letters, but presume all three of these subjects have been mentioned, more or less.

11 x-int. How many letters, during the present year of 1865, have passed between you upon any, and which, of those subjects?

Ans. I cannot tell how many letters have passed, but think that six or eight letters may have passed each way during the year 1865. I think they refer mainly to the introduction of the pavement in various cities, and that his suit against the city has frequently been mentioned in them.

12 x-int. Before you tried the experiment of Nicholson's pavement in Chicago, did you have any, and what, opportunity of observing it in practical operation?

Ans. I had no such opportunity.

13 x-int. Did you never see it before you saw it at Chicago?

Ans. I never did.

14 x-int. To what extent, and when, and in whose presence, did you make the examination of the pavement on Wells street, mentioned in your direct examination?

Ans. I cleaned off the mud and refuse from the board flooring where the hole through the pavement is. I measured the de-
491 flection of the boards from the horizontal line. I measured the distance of the hole from the south line of the alley, and measured roughly the dimensions of the hole. It was done this morning about ten o'clock, in presence of Mr. Stephen A. Goodwin, J. McGregor Adams, Tuthill King, and some other men, who I did not notice particularly.

15 x-int. Were either of the defendant's attorneys or any agents of the city present, or invited to be present, at that examination?

Ans. I did not see any of them, and do not know whether they were invited or not.

16 x-int. Has any part of the original pavement on Wells street, between Lake and South Water, been repaired; if so, when, and to what extent, since it was originally laid down in 1856 and 1857?

Ans. I have seen men repairing parts of this pavement south of the alley, but do not know when nor to what extent.

17 x-int. What is the present depth of the shortest long block which you observed now remaining in that pavement?

Ans. I did not examine anywhere else except at the hole; the

whole blocks at the edges of the hole measured four and a quarter to four and a half inches in depth.

18 x-int. Does not green plank contain a greater proportion of moisture than plank thoroughly seasoned?

Ans. It does.

19 x-int. Were not the city advertisement and your bidding thereon, printed or in writing, referred to in your examination-in-chief?

Ans. The advertisement was printed; my bid was in writing.

20 x-int. How recently, before your conversation with Messrs. Letz and Gindele, referred to in your direct examination, had you
492 talked or corresponded with Mr. Nicholson, or his attorneys, or either and which of them, upon the subject of his pavement or his suit?

Ans. I do not remember any conversation or correspondence on that subject taking place before that did; that is, in this immediate connection. This correspondence with Nicholson was going on all the while; I had been writing him more or less all the while.

21 x-int. Did you ever see the Nicholson pavement constructed with dowells and without any supporting foundation beneath it?

Ans. I never did.

22 x-int. Did you ever see it with any other than a wooden foundation, and did you ever see his wooden foundation where the boards were cemented, fastened, or matched together, or otherwise constructed, that water could not pass down between the joints of the boards?

Ans. I never did see it so laid.

23 x-int. Did not the controversy with DeGolyer, of which you have spoken in your direct testimony, ripen into a suit by you against him whilst you had the control of Nicholson's patent right in Chicago?

Ans. It did not.

24 x-int. What was the amount involved in the controversy with Mr. DeGolyer, in which you claim he vowed revenge, and who were the parties thereto and pecuniarily interested therein?

Ans. The amount involved was something under twenty dollars; Mr. DeGolyer and myself were the parties interested in the
493 amount; I don't remember whether Mr. Nicholson had any interest or not in this small sum.

SAMUEL S. GREELEY.

Subscribed and sworn to before me, this 20th day of November, A. D. 1865, and read over to witness before signing.

P. A. HOYNE.

THURSDAY MORNING, *November the twenty-third, A D.* 1865.

Examination of witnesses was resumed on behalf of the complainant; Edward S. Renwick called, and having been by me first duly cautioned and sworn to tell the truth, the whole truth, and nothing but the truth, in the cause aforesaid, thereupon testified as follows:

First direct interrogatory. What is your name, age, and occupation, and where do you now reside?

Ans. My name is Edward S. Renwick; I am forty-two years old, and upwards; I am occupied principally in soliciting patents and acting as an expert in the trial of patent causes in the United States courts; I reside in the city of New York.

2 int. State what have been your opportunities and experience in the study and understanding of labor-saving machines and various mechanical devices, and whether or not the arrangement and construction of street pavements of any sort have been within your observation or experience, and also what has been your experience in the investigation and examination of patents?

Ans. I was engaged for a number of years in the construc-
494 tion of machinery and in the superintendence of machinery in motion, and still make this occupation a part of my business; I have been engaged for the greater part of the past sixteen years in preparing applications for patents, in soliciting patents, and in acting as expert in the trial of patent causes; and in the course of my business I have been called upon to make many investigations into the history of the useful arts as found in books and in patents, and have had to examine a great number of machines of various descriptions, and a great number of descriptions of machines of various descriptions, for the purpose of ascertaining their similarities and differences, and in order to enable me to explain such similarities and differences in trials in the United States courts. The subject of pavements for cities has always been a matter of great interest to me; I have examined a number of descriptions of pavements found in printed books; I have also carefully observed the operation of pavements of various descriptions in actual use, and the effects of travel upon them; I have also examined descriptions of pavements found in patents.

3 int. Have you examined and are you familiar with the reissued patent specifications of Samuel Nicholson, annexed to his patent of date December, 1863, as set forth with the drawings atttached in complainants Exhibit B in this cause?

Ans. I have carefully examined the said exhibit and am
495 familiar with its contents.

4 int. Please to state in what you regard the invention of Samuel Nicholson to consist as set forth and described by him in his said reissued specifications.

(Question objected to as enquiring for a conclusion of law, and also as calling for the contents of a written instrument.)

Ans. The invention of Nicholson, described by him in the said Exhibit B, is, as I understand it, a compound wooden pavement, which is a combination of several things, constituting members or parts of the combination. The first of these parts is a foundation, which is formed upon the surface of the road-way. The specification describes that this foundation may be made of several materials, which are tarred paper, lime mortar, or hydraulic cement, and a cheap flooring, by which I understand a wooden flooring, which may be covered with tar or other preventive of moisture. The object and effect of this foundation is to support the superstructure of wooden blocks, by distribut-

ing the strain on any one block over a larger surface of the road-way than that covered immediately by the block, or in other words, upon a surface larger than the surface of the bottom of the block. The object and effect are further to prevent moisture from being absorbed from the ground by the blocks. The second part of the com-
496 bination consists of two sets or series of wooden blocks, which are described as being cut with parralel lines, sides, or surfaces, and in two sets, the blocks of each set being of equal height throughout their whole extent, and the blocks of the two setts being of different heights; these two setts of blocks are arranged in such manner as to form cells, whose sides are bounded by the sides of the upper ends of the longer blocks, and whose bottoms are closed entirely by the shorter blocks; the shorter blocks in this arrangement propagate lateral strains from the longer blocks to the adjacent longer blocks, so that the blocks are made stable in their positions when first put in place by the mutual support which they afford the shorter blocks; also by closing entirely the bottoms of the cells between the longer blocks, prevent the filling which is placed in those cells from working downward to the bottoms of the longer blocks, and working underneath their bottoms.

The third part of the combination is the filling, which is placed in the cells between the longer blocks, and on the tops of the shorter blocks; this filling is described as being made of broken stone or clean gravel, the pieces of which are cemented to each other and to the wooden blocks by tar or other suitable cement, poured in the
497 interstices in a liquid form. The object and effect of this filling is to fill up the cells, so that the whole surface of the pavement is substantially uniform, and afford a good footing for animals, particularly in such weather as would be likely to render the surface of the wooden blocks slippery; the filling also, by reason of the cementing material which is employed, tends to prevent the passage of moisture downwards between the blocks; and from its elasticity, it is capable of spreading latterally under the pressure of the travel and filling up spaces, which would otherwise be left by the shrinkage of the wooden blocks.

The patentee describes two modifications of the woooden blocks, which may be used according to the judgment of the user, and which are equivalents of each other in the triple combination, of which they form a part; in one of these modifications, the horizontal sections of the blocks are all square, in the other modification the horizontal sections are parrellograms, the shorter blocks being formed by strips of boards set on edge between the rows of longer blocks.

5th int. Have you examined, and are you familiar with, the English patent specifications of Richard Love, jr., David Stead, Thomas Wood, the younger, William Grimman, John Perring, Joseph Crannis and Robert Kemp, and Henry Austin, being defendants Exhibits
498 A, B, C, H, E, "F," "G," annexed to the stipulation in this cause?

Ans. I have carefully examined and am familiar with the specifications of the English patents referred to in the question.

6th int. State whether or not you find the invention and combination of said Nicholson, as set forth in his said reissued patent specifications, described and set forth in the said specifications of Henry Austin, and give your reasons for any opinion you shall express.

Ans. I do not find the invention of Nicholson described or set forth in the specification of the Austin patent; on the contrary, I find a pavement described in the Austin patent, which is substantially different from the pavement of Nicholson, in the respect that the Austin pavement does not contain any arrangement of long and short blocks. The Austin pavement consists of one series of blocks of uniform length, secured to a foundation or flooring in such manner and in such arrangement, that cells are formed between the parralel rows of the blocks, which cells extend from the tops of the blocks down to their bottoms, there being nothing to prevent the filling material, which is placed in the said cells, from passing down to and working underneath the bottoms of the blocks, as no short blocks are used in the Aus-
499 tin pavement; the only means of maintaining the blocks exact, or holding them in their places when they are first placed, is the cement or fastening between the bottoms of the blocks and the foundation on which they are placed; consequently the blocks do not afford mutual support, and the filling which is placed between them could not be rammed into the cells in the manner described in the Nicholson patent, without the application of some artificial support, which being not part of the pavement, would have to be applied and removed in the process of its formation.

7th int. Plense to state whether or not you find described in the Austin specifications any equivalent for the short blocks in Nicholson's combination, and give your reasons for any opinion you may express.

Ans. I do not find in the Austin specification any equivalent for the Nicholson short blocks. The Austin patent describes blocks of one length only, and states that they are to be fastened to the foundation with intervals or spaces between them to the entire depth of the blocks; which description negatives the idea of the use of short blocks between the long blocks, because if short blocks were inserted between the long blocks, the intervals or spaces between the
500 long blocks could not extend to the entire depth of the blocks. This specification also describes that these spaces (which as before stated) are to extend to the entire depth of the blocks, are to be filled with broken stone, refuse, or broken slate, grit, gravel, sand, or any hard or fibrous substances, and that this filling is to be cemented or concreted together with a liquid cement poured into it; this part of the description shows that the filling material is to be in granular form, capable of being concreted by a liquid cementing material, and precludes the idea of the insertion of a block which does not require to be concreted; besides, if the filling were to be a block of wood, it would not be a short block, because the description states that the spaces are to be filled with a filling material; if a block were therefore used as the filling material, it must, in order to fill the

space, be as high as the long blocks, in which case the pavement would consist in the substance of a series of blocks of uniform height, placed so as to touch each other without filling between them, which would be contrary to the whole description of the Austin patent.

8th int. State whether or not cotton, wool, flax, hemp, or oakum are substances known in the arts as fibrous substances, and
501 whether [or] or not such substances or other substances of a similar character would, in you opinion, be equivalents for the filling of the cells or channel, within the directions given by Austin in his specifications, having reference to the purposes to be subserved by such filling of which Austin speaks and as he directs such filling to be made.

Ans. Cotton, wool, flax, hemp, and oakum are known in the arts as fibrous substances, but they are generally designated by the compound terms fibrous and textile substances to distinguish them from other fibrous substances, such as wood and wrought iron, which are not capable of being spun. The said fibrous substances would not be the equivalents of the filling described by Austin in his specification, because from their softness the wear upon them would not keep pace with the wear of the blocks, which is described as one of the advantages of the filling in the Austin patent, neither would they "avoid that slipperiness which is prevalent in other wooden pavements when worn," which is mentioned in the Austin patent as another advantage of his pavement, and which is clearly due to the use of a filling material in granular form. The materials mentioned in the question would also, if inserted in the spaces of the Austin pavement, tend to prevent the entrance of a liquid cement as they would act
502 somewhat like the oakum caulking inserted between planks in building vessels.

9th int. Please to state whether or not you regard the differences you have pointed out between the pavement described by Austin in his specification and the invention and combination of Nicholson, referred to by you, as differences in form or construction or as differences in principle.

(Question objected to as leading and suggestive.)

(Question modified by erasing the word merely, and objection withdrawn.)

Ans. The differences I have pointed out are differences in structure, which make the Nicolson pavement substantially different from the Austin pavement in principle or mode of operation, the two pavements being substantially different combinations.

10th int. State whether or not you find the said Nicholson invention or combination described and set forth in the said specifications of David Stead, and give your reasons for any opinion you shall express.

Ans. I do not find the Nicholson combination described or set forth in the specification of the English patent of Stead. The Stead specification describes a number of pavements of wooden blocks, each of which pavements is substantially different from the Nicholson pavement. The pavements represented by figures 1, 2, 3, 4, 5, 6,

503 7, 8, 9, 10, 11, 12, 13, 14, 15, 18, 19, 23, 24, and 25 all differ substantially from the Nicolson pavement, in the respect that they have no cells of any kind in which filling material, such as is described by Nicolson, can be placed. All of the pavements represented and described by Stead, with the exception of those represented by the figures 10, 11, 12, & 13, differ substantially from the Nicholson pavement in the respect that they are not described as being placed upon any artificial foundation such as Nicholson describes or any equivalent for the same, fulfilling the purpose of supporting the blocks by distributing the strain upon each block and of preventing moisture passing upwards to the blocks. In fact the particular description given upon page 4, of the specification, commencing at line 10, of the pavement represented by figures 18 & 19, shows that the intent of the patentee was to place his blocks directly upon the earthen roadway or foundation which was capable of being penetrated by wooden piles, such as are designated by the letter M, in figure 18 of the drawing. All of the pavements represented and described by Stead, with the exception of those represented by figures 16, 17, 20, 21, & 22, differ substantially from the Nicholson pavement in the respect that they do not contain filling of any description placed in cells between the wooden blocks. The pavements

504 represented in the Stead drawing at figures 16, 17, & 20, differ substantially from the Nicholson pavement in the respect that they have no arrangement of two series of long and short blocks, such as is described by Nicholson, and no equivalent for such arrangement, the cells which are described in the pavements represented by said figures extend to the entire depth of the blocks, so that the filling material which is placed in them has free access to the bottoms of the blocks, and is permitted to work underneath them instead of being sustained and prevented from working downwards as it is in the Nicholson pavement by the employment of short blocks which by filling up the entire spaces between the lower ends of the longer blocks form the entire bottoms of the cells. The Stead pavements, represented at figures 21 & 22 differ substantially from the Nicholson pavement not only in the respect that the blocks are not supported by an artificial foundation which prevents moisture from passing up to the blocks, but also in the respect that they do not contain two series of long and short blocks such as are described in the Nicholson specification. The Nicholson blocks, as before stated by me, consist of two setts, the blocks of each sett being of equal height throughout their whole extent; and the blocks of the two setts being of different heights, this construction enables them to be formed from the ordinary lumber found in the market by simply cross-cutting it; and in using such blocks cells are formed by a peculiar arrangement

505 of the two setts of blocks, the blocks of one sett being arranged alternately with the blocks of the other sett. In the Stead pavement, represented by the figures 21 & 22, there is but one series of blocks in the pavement, all of which are of uniform height, but the individual blocks, instead of being of uniform height throughout their whole extent, are made of unequal height at differ-

ent parts by cutting away portions of their upper ends so as to form shoulders at some distance below their upper surfaces; blocks of this structure require a much greater amount of labor in their formation than the Nicholson blocks, because they would have to be handled once for each cut upon their sides, those with four shoulders requiring four handlings in addition to the one by which they are cut from the lumber, for the purpose of sawing a kerf where the shoulders is to be, and four additional handlings for sawing or splitting down the portion of the block which is to be removed; moreover, blocks of the Stead structure, represented at figures 21 & 22, do not require the alternate arrangement which is necessary in putting down the Nicholson pavement, because the Stead blocks are all of uniform height, they must, however, be all sett with one end uppermost, while the Nicholson blocks may be sett with either end uppermost, the pavier thereby having it in his power to select which end of the block is best suited to form the upper surface of the pavement.

11th int. Please state whether or not you find described by
506 Stead in his figures 21 & 22 any cells or spaces which are to be filled with any artificial substance similar to that described by Nicholson as his filling, or how the same are to be filled, if at all, as described by Stead.

Ans. In the description in the Stead specification of the pavement represented by figures 16, 17, 20, 21, & 22, mention is made of filling the cells of figures 16 & 17 either with wooden pieces suited to their shape or with cement or asphalt; the description of the pavement represented as figure 20 shows that the cells in it may be filled in the same manner as the cells of figures 16 & 17. In both of these kinds of pavement the cells differ from those of the Nicholson pavement in the respect that the former extend entirely to the bottoms of the blocks so that the fillingmaterial, if cement or asphalt, extends down to, and can work, beneath the bottoms of the blocks. If the filling used in the Stead pavements, represented as figures 16, 17, & 20, be wooden pieces suited to the shape of the blocks represented, then no cells are left for the reception of such filling as is described by Nicholson; if the filling used in these Stead pavements be cement or asphalt then the Stead filling is substantially different from the Nicholson filling in the respect that the former is composed wholly of a cementing material instead of being composed of a hard granular material, consolidated by a cementing material. The descrip-
507 tion of the Stead pavements, represented at figures 21 & 22, states that the channels between the upper ends of the blocks may be filled up with cement; such a filling material differs substantially from the filling described in the Nicholson patent in the respect that it consists of the cementing material alone, instead of consisting of a hard granular material consolidated by a [a] cementing material.

D. int. 12. Please to state whether or not you regard the differences you have pointed out between the pavements described by David Stead in his specification and the invention or combination of Nicholson referred to by you are differences in form or construction or are differences in principle?

Ans. The differences which I have pointed out are substantial differences in structure and principle or mode of operation, the Stead pavements being combinations which are substantially different from the combination which constitutes the Nicholson pavement.

13 int. State whether or not you find the invention or combination of Nicholson, as set forth and described in his said specifications, described and set forth in the said specifications of Thomas Wood, the younger, and give your reasons for any opinion you shall express.

Ans. I do not find the Nicholson combination described or
508 set forth in the specification of Thomas Wood, the younger. The pavements described in the Wood specification differ substantially from the Nicholson combination in the respect that they are formed of blocks of peculiar form, viz: pyramids and double wedges combined together in a peculiar manner, so as to form a species of arch, the members of which mutually support eact other in a manner similar to the arch stones of a bridge, such blocks cannot, of necessity, have parralel sides, lines, or surfaces, as the Nicholson blocks are described as having; neither can the former be cut from the lumber by simply cross-cutting as the latter can. The pavements described in the Wood patent differ also substantially from the Nicholson pavement in the respect that no description is given of the use of an artificial foundation such as is described by Nicholson, or of any equivalent therefor, the only materials mentioned in the Wood specification as being beneath the wooden blocks, being shingle, gravel, and sand, all of which are granular materials, not consolidated by cement, and therefore incapable of affording the support that is afforded by the Nicholson foundation or of preventing moisture from passing up to the wooden blocks.

14 int. Please state whether or not you regard the special
509 forms of blocks, referred to by you in your last answer, as described by Wood as an essential element of his combination; and also whether or not you find the same in the Nicholson combination.

Ans. The special forms referred to by me, as described by Wood, are, in my opinion, essential elements of his combinations, great stress being laid by him in his specification upon the peculiar forms and upon the results which are attained by their employment, which renders the integrity of the pavement independent of the firmness of the foundation upon which it is laid. I also regard the parralelism of the sides and surfaces of the wooden blocks of the Nicholson combination as an essential feature of that combination, because in both of the modifications which Nicholson describes that feature is made prominent; because it enables the blocks to be cut directly, as Nicholson describes, from lumber without subsequent trimming to a particular shape, which operation is not only not described in his patent, but would be attended with a greater expense than the value of the blocks which he describes. I also regard it as essential, because Nicholson describes a foundation of concrete material for the purpose of supporting his blocks, and blocks with parralel sides and surfaces require such support in order to preserve the integrity of the

pavement; for if there were no such support, each particular block when struck by the wheel of a heavily laden wagon would be driven downwards into the earth or other loose material beneath. 510

15 int. Please to state whether or not you regard the differences pointed out by you between the Nicholson invention or combination and the pavements described by Wood in his specifications as differences in form or construction or as differences in principle.

Ans. I regard them as differences in structure and principle or mode of operation, the Wood pavements being substantially different combinations from that of Nicholson.

16 int. State whether or not you find the said invention or combination of Nicholson described and set forth in the said specifications of John Perring, and give your reasons for any opinion you shall express.

Ans. I do not find the invention or combination of Nicholson described or set forth in the specification of John Perring; the pavements described in the Perring specification differ substantially from the Nicholson pavement, in the respect that they do not contain any arrangement of long and short blocks which is the same or substantially the same as the arrangement of long and short blocks described by Nicholson, nor do the Perring pavements contain any equivalents of the arrangements of the Nicholson long and short blocks in some forms of the pavements described by Perring; slips of wood are employed between the blocks, but such slips instead of [of] forming the bottom of cells or spaces between the blocks, do not extend down to the bottoms of the blocks but only to within about an inch of their lower surfaces, so that the stability of the slips of wood depends wholly upon the pins which connect them with the blocks; in this respect the arrangement differs substantially from the arrangement of the short blocks described by Nicholson, in which the short blocks fill up the bottoms of the spaces between the longer blocks. and are supported directly by the foundation upon which they bear; the pavements described in the Perring specification also differ substantially from the Nicholson combination, in the respect that they do not contain any filling placed in cells, which is the same or substantially the same as the filling which constitutes a part of the Nicholson combination; nor do the said Perring pavement contain any equivalent for the said Nicholson filling. The Perring patent describes that other elastic substances besides wood may be used between the blocks, but neither describes nor suggests the employment of a granular material, consolidated or rendered concrete by a cementing material; and if the specification be followed, the other elastic material which may be used in place of the wood, must, of necessity, be applied in the same manner as the wood, that is, by being formed into slips or slabs which are pinned fast to the blocks, with the edges of the slips distant about an inch from the upper and lower surfaces of the blocks, so that either of these surfaces may be placed upwards as directed in the Perring specification at page 5, line 14, and following. The elastic material must also be applied in slips, in order that 511 512

holes larger than the pins may be made in it, to permit the pins or pegs to play, as described at the bottom of the fifth page of the specification.

17 int. What is the office of the slips of wood interposed between the blocks in Perring's pavement, as he describes it?

Ans. The patentee describes that the slips of wood are for the purpose of separating the blocks, so that a sure foothold may be afforded to horses and other animals without reducing the substance of the blocks.

18 int. State whether or not such slips so constructed as you have described, and fulfilling that office which you have stated in
513 the manner set forth, whether composed of wood or any other elastic substance, could be used to support such a filling and in the way described by Nicholson?

Ans. They could not, because they depend for their positions only upon the pins which connect them with the adjacent blocks, and therefore they could not afford a sufficient support for the Nicholson filling.

19th int. Suppose that the substances of cork or India rubber were used for these slips in Perring's pavement, constructed as he directs, state what would be the effect of such construction in reference to the passing of water from the surface of the pavement to the bottom, and how slips of such material would fulfil the functions assigned to his slips by Perring.

(Question objected to, to first clause as erroneously, supposing that Perring so directs, and also on the ground as irrelevant, and to the whole as irrelevant.)

Ans. The employment of slips of cork or India rubber, in the manner that Perring describes slips of wood to be used, would not prevent the passage of water downwards to the bottom of the blocks, because there would be no material inserted in a fluid state to fill up the crevices between the blocks, and consequently the water could pass down through such crevices; such slips would separate
514 the blocks, so that a sure foothold would be afforded to horses and other animals, but they would be of a very bad material for the purpose, because, being highly elastic and yielding, they would not maintain the blocks rigidly in their positions, but would permit them to move when subjected to lateral strains from the feet of the animals or the wheels of carriages.

20th int. Please to state whether or not you regard the differences you have pointed out between the Nicholson invention or combination and the pavements described by John Perring in his specifications as differences in form of construction or as differences in principle.

Ans. I consider them as differences in structure and principle or mode of operation, the Perring pavements consisting of combinations which are substantially different from the Nicholson combination.

Int. 21. State whether or not you find the said invention or combination of Nicholson described and set [set] forth in the said specifications of Joseph Crannis and Robert Kemp, and give your reasons for any opinion you shall express.

Ans. I do not find the said Nicholson combination described or set forth in the specification of Crannis and Kemp. The Crannis and Kemp specification describes a number of wooden pavements, each of
515 which differ substantially from the Nicholson combination in the respect that the former does not contain any filling which is the same or substantially the same as the filling which is an essential member of the Nicholson combination; nor does any one of the said Crannis and Kemp's pavements contain any equivalent for the said Nicholson filling, no filling material of any description being described in the Crannis and Kemp specification to be placed in cells or between the wooden blocks of the pavements.

22d Int. State whether or not you find the said Nicholson invention or combination described in the specifications of William Grimman and Richard Love respectively, or in either of them.

Ans. I do not find the said Nicholson combination described or set forth either in the specification of Grimman or in that of Love.

23d Int. Please to state whether you regard the different modes suggested by Nicholson for the construction of his foundation as equivalents for each other in the combination described by him, or otherwise; and also whether or not the different foundations described by him may, according to such specifications, be used seperately or one or more of them combined together.

(Question objected to as leading and ambiguous.)

516 Ans. I do regard the various foundations described by Nicholson as equivalents for each other in the combination of which they form parts, for the purposes described by him, because they all operate in substantially the same manner in supporting the blocks, by distributing the strain on any one block over an extent of surface of the roadway greater than the surface of the block, and because they also operate in the same manner to intercept the passage of moisture from the ground; they undoubtedly differ in the degree of perfection with which they accomplish these purposes, but the mode of operation of all of them is the same. The specification describes that they may be used seperately; but a person who used two or more of them would use the combination of Nicholson, and one or more additional elements, which, without changing the combination, would increase its perfection and value as a pavement.

Cross-examination.

First cross-interrogatory. How long have you been a resident of the city of New York; and how long have you felt the interest, of which you testify, in the subject of pavements?

Ans. I was born in the city of New York, and resided there until the year 1840; in the month of February, of that year, I became a resident of the State of New Jersey; and, after residing in
517 several other places, I returned to New York in November or December, 1855; I think I have resided in that city since that date. The first time that my attention was drawn particularly to pavements, was at the time wooden pavements were being put

down in the city of New York; there were some circumstances connected with those pavements which led me to examine them carefully, and from that time to the present the construction of pavements and their action under travel has been a matter of considerable interest to me, so much so that I have occasionally gone out of my way for the purpose of examining new forms of pavements.

2 x-int. When was it that wooden pavements were first put down in New York; and in what parts of that city were they laid, and when as near as you can tell; and was there more than one kind of wooden pavement used there or not?

Ans. I cannot state when the first wooden pavement was put down in New York, nor can I state all the places where they were put down; my reccollection is that they were put down some years before I left college, in 1839. I recollect that one wooden pavement was put down in Chatham street, near the Park; another in Broadway; and I think a third in the lower part of Greenwich street; all of these
518 pavements were laid down some years before the year 1839. According to my recollection, all of the pavements had wooden blocks of uniform height, and none of them had cells; but in one or more of the pavements, I recollect seeing, some of the blocks differed from others in their horizontal dimensions; my recollection also is that in some instances the blocks were placed on board foundations, and in some instances directly upon sand; my recollection also is that the blocks of the pavement in the lower part of Greenwich street were connected by pins passing horizontally from block to block; I also know that some of the blocks of the pavement in Chatham street were saturated through and through with coal tar.

Adjourned till to-morrow, being Friday, November 24th, A. D. 1865, at 10 o'clock a. m.

A. A. HOYNE, *U. S. Comm'r.*

Met pursuant to adjournment this Friday morning, November 24th, A. D. 1865; present as on yesterday; cross-examination of the witness, Edward S. Renwick, resumed with third cross interrogatory.

3 x-int. Were you ever a civil engineer by profession? Did you ever follow the business of a street pavier, or of a pavement contractor, or of a builder as a trade?

Ans. I received the education of a civil engineer, but never practised it as a profession, although I was employed in my younger days in some civil engineering business, and have been at a later
519 period consulted in matters presenting engineering difficulties. I never followed the business of street pavier, or pavement contractor, or builder as a trade.

4 x-int. Do you know of any book or books, and if so, what, which contains the history and descriptions of the various kinds of paving which of such books, if any, have you read, and what is the value thereof as authority in that art?

Ans. I don't know of any one book that contains a history of the various kinds of pavement that have been used, or that are in use at the present day. I have seen a number of books which give descrip-

tions of various modes of making pavements; but as my memory of names is bad, and I have not a library here to go to to refresh it, I can give the names of but very few; one that I recollect is Gillispie's Treatise on Road-making; another is Cressy's Civil Engineering; another is a work entitled, "The Public Works of Great Brittain" these are all the names that I recollect at present; all of these works are standard works. I may also state that there are a nnmber of papers on pavements to be found in the foreign periodicals on scientific subjects, among which may be mentioned the Civil Engineer and Architects Journal, and the London Mechanics' Magazine, and the French Annalés des Poutes et Chaus-sees, which are reliable
520 and respectable works.

5 x-int. Did you ever see and examine the English patent specifications which have been produced to you as exhibits in this cause, before your attention was called to them in or for the purposes of this suit; if so, when?

Ans. I never examined them until my attention was called to them for the purpose of this suit.

6 x-int. Have you ever examined any English patent specifications of wooden pavements, other than said exhibits; if so, whose? and do any or either, and which of them, describe or contain a pavement, or pavements of alternate broken stones or gravel or wooden blocks, or a pavement at all similiar to Nicholson's?

(Question objected to as calling for evidence incompetent and improper under the issues in this cause.)

Ans. I have never examined any other English specifications of wooden pavements than said exhibits.

7 x-int. Is the Nicholson combination an appropriate pavement for a flat road-bed, without any crown to the street?

Ans. I don't know of any such road-bed in practical use except the plank roads, which are made nescessarily flat in order that the planks may lay crosswise upon them. I don't think the Nicholson combination, or any other pavement except a plank road, is appropriate for such a road-bed.

8 x-int. Is not cement mentioned by Nicholson as one of his fillings in some one or more of his descriptions of his pavement which
521 have been examined by you?

Ans. The word cement is used in the description of his filling, but the connection in which it is used shows that it is not intended to mean hydraulic cement, but a cement such as tar or pitch, and having the properties which these materials have when used in the mode described in the Nicholson patent as cements for the filling.

9 x-int. Would not any lime cement be a filling equivalent to Nicholson's?

Ans. In my opinion no lime cement would be an equivalent for the filling described by Nicholson.

10 x-int. What are the chief substantial and distinguishing characteristics of a wooden pavement generally?

Ans. The distinguishing characteristic of a wooden pavement generally, is that the roadway is made substantially of wood in contra-

distinction to being made of other materials, such as iron or stone.

11 x-int. What are the chief advantages of a compound wooden pavement, presenting a surface of wood and appropriate filling, as compared with the smooth-topped wooden pavement?

Ans. The chief advantages are, that the former pavement is less slippery in wet weather, affords a better footing for animals, and when the filling is cemented together with tar or similiar cementing materials, which can be poured in in a liquid state, and which
522 when hardened, is yielding, so that it can spread laterally, and make up for the shrinkage of the wood, and is also impermeable to water, the pavement possesses the advantage of greater durability, as it is less liable to be affected by rot.

12 x-int. Is the prevention to tendency to rot one of the main points sought to be attained by such a pavement?

Ans. From my own observation I am convinced that an effectual prevention against rot is the great thing now required in wooden pavements, because all that I have ever noticed when taken up were destroyed by rot before the surface upon which the travel passes was worn out.

13 x-int. In the practical use and operation of wooden and other pavements in larger cities, does not the street dirt accumulate so rapidly as to be in itself an element in the management of the pavement; that is, does it not require to be very frequently removed for the suceessful use and operation of the pavement, and would it not rapidly fill up any spaces not more than an inch and a half wide which might be left between the blocks, say from two inches deep downwards to the foundation?

Ans. The frequency with which pavements should be cleaned depends upon the amount of travel over them, whether in large
523 cities or elsewhere. If there be a large amount of travel, and the pavement be one which, from its construction, does not permit the earth from beneath to work upwards through it, (as is the case with cobble stone pavements,) the accumulations of street dirt would rapidly fill up such spaces as those mentioned in the question; and the dirt, being composed mainly of manure, would tend to rot the wooden pavement more rapidly than if there were no cells to retain such dirt. Upon the subject of cleaning the streets in large cities, I may state that Broadway, in the city of New York, is cleaned every night; and I have been informed that the average amount of dirt removed at each cleaning between Union square and the Battery, amounts to forty cart loads.

14 x-int. Would such street dirt have a greater tendency to produce rot in wooden pavements than water?

Ans. I have no doubt that it would, because the water which passed through that dirt would be charged with the foul matter which it dissolved.

15 x-int. In your comparison of the Stead, the Austin, and the Wood pavements, as described in their specifications respectively, with the Nicholson invention or combination, so called, have you referred to all the points which, in your judgment, may be fairly con-

sidered as resemblances or analogies, and to all the points
524 which may be fairly considered as substantial differences between them?

Ans. I referred to the points which were sufficient, in my judgment, to show that no one of the pavements described in all of the said patents were substantially the same as Nicholson's combination. I did not mention all the points of similarity or resemblance between any one of these pavements and the Nicholson combination; and I do not recollect whether I referred to all the points of dissimilarity, my recollection being (without refreshing it by carefully examining my testimony) that I generally confined myself to the prominent points of dissimilarity.

16 x-int. Is it your present recollection that you did refer to the points which, in your judgment, were prominently dissimilar?

Ans. That is my recollection.

17 x-int. Have you ever personally examined the practical operation of a compound wooden pavement where the bituminous concrete filled the whole spaces between the blocks down to the foundation, without any strip or short block at the bottom of the cell?

Ans. I never have.

18 x-int. Nicholson speaks of ramming before tarring. Is ramming after, and not before, the tarring an essential change either in the structure or construction of the pavement?

Ans. No; not in my opinion.

525 19 x-int. I understand you to say that if the spaces between Austin's blocks were filled the entire depth with pieces of wood, it would amount, in substance, to another kind of pavement. Within what distance of the top of the Austin block might such a strip of wood approach from the bottom and still preserve the character of an Austin pavement?

(Question objected to, because the question incorrectly represents the witness as having stated that the spaces in the Austin method might, within his specification, be entirely filled with pieces of wood.)

Ans. The introduction of pieces of wood between the wooden blocks described by Austin, so as to partially or wholly fill the spaces between the wooden blocks, would make the pavement substantially different from Austin's, whatever distance the tops of those filling pieces might be below the tops of the blocks.

20 x-int. Who do you understand to have been the first patentee in England or America of wooden pavements and of compound wooden pavements, presenting the surface of wood and concrete alternately?

(Question objected to as calling for evidence improper under the issues of this cause.)

Ans. I have never examined the American or English patents for the purpose of ascertaining the thing asked for in the ques-
526 tion, and I don't know.

21 x-int. Do you regard the paralelism of the sides and surfaces of Nicholson's blocks such an essential element in his combi-

nation, that any blocks not so formed would be substantially different in principle from Nicholson's combination?

Ans. I regard the parralelism of the sides and surfaces of Nicholson's blocks so essential a distinguishing characteristic of them, that blocks not so formed would be substantially different in principle from his, and when used in a pavement would make a substantially different combination from Nicholson's.

22 x-int. Would not the inside edges of the two outside blocks, say a foot wide and six inches high, standing upon the opposite sides of a roadway thirty feet wide, with a foot-crown prepared for the reception of Nicholson's pavement, be at an angle of several degrees with each other, if such inside edges were produced down to the point of intersection?

Ans. Of course they would?

23 x-int. Does Nicholson's specification describe a foundation of concrete material?

Ans. No.

24 x-int. Will you be kind enough to explain what you mean by the term (mode of operation) as applied to a wooden pavement?

Ans. It is used as a synonym for principle, and when applied to a pavement means the mode in which the combination oper-
527 ates as a whole; and when applied to the parts of a pavement, would mean the mode in which the parts operate relatively to each other, and to extraneous influences and forces.

25 x-int. What are the dimensions of the Perring slips?

Ans. A small one and a large one are described. There is no scale upon the drawing; but taking the statement in the specification, at page 5, that the slips come within one inch of the upper and lower surfaces of the blocks, and applying a scale constructed on these directions to the drawing, I find that the slips are from three and a half to four and a half inches wide, and from about 7 inches long, for the shorter slips, to about two feet and a half long for the longer ones.

26 x-int. Is a strip of one-inch board three inches wide and four feet long a short block within the description and plan or combination of Mr. Nicholson?

Ans. It is an equivalent for the short blocks of Nicholson, and such a strip is within the description of his second method of constructing his pavement when it is used in combination with long blocks, so that the strips form the bottoms of the cells between the longer blocks.

27 x-int. Do you consider the use of tar on the flooring an essential element of Nicholson's combination when constructed upon a wooden foundation, and is it your opinion, from the language
528 of the specification, that a workman of ordinary skill in constructing wooden pavements would understand, from the specification alone, that in constructing a pavement with cheap flooring, after the specification, he would necessarily be required to use tar on both or either, and which sides of such foundation? if so, please to refer to the parts of the specification, complainant's Exhibit B, by page and line, which is so called for such tar.

Ans. Whether the use of tar upon the flooring be or be not an essential element of Nicholson's combination, depends upon the construction which is given to the language of his specification. If the words, ("may be also covered with tar,") be construed to be synonomous with the words "must be covered with tar," in view of the statement in the paragraph commencing with the words "moisture is excluded," then the tarring of the boards of the foundation is made an essential element of the foundation of cheap flooring. But, in my opinion, such would not be the obvious construction of the language, and consequently I consider that the tarring is not made an essential element of a Nicholson foundation of cheap flooring, but that it is left to the judgment of the user to apply tarring or not to the flooring as he may see fit, the description of the patent showing, however, that the patentee regards the tarring of the flooring as an advan-

529 tage. In my opinion a workman of ordinary skill in the construction of pavements would not of necessity tar the flooring when following Nicholson's directions, but he would use his judgment to decide whether the tarring was or was not expedient in view of its cost, bearing in mind the fact that the description of the patent clearly shows that such tarring is considered advantageous by the patentee.

28 x-int. Should you regard a foundation of bricks arched in cement, or of flag-stones, or concrete, or slate, or iron, or any other hard metal, or a composition of sand and lime and tar, or a macadamized road-bed thoroughly packed and brought to a sufficiently smooth surface, or any or either of them, to be equivalents for Nicholson's foundation, as you understand it, assuming, of course, that they should be made of appropriate thickness, and that the Nicholson superstructure is placed thereon?

Ans. I should regard all the foundations enumerated in the question, with the exception of the macadamized road-bed, as the equivalents of Nicholson's foundation when used as stated in the question, and assuming that the question implies that the slate or iron, or any other hard metal, are laid down in slabs or sheets so as to make a flooring.

530 29 x-int. Why would not the macadamized road do if properly packed and smoothed and of an appropriate thickness.

Ans. Because the macadamized road-beds with which I have been acquainted have either been earth or small loose stones, which would not perform the functions of Nicholson's foundation when used in his combination.

30 x-int. Will you please to describe briefly McAdam's method of road-making, and state whether a macadamized road, thoroughly packed and brought to a smooth surface, would be an equivalent for said Nicholson's foundation when his superstructure was placed upon it.

Ans. According to McAdam's system the road-bed was prepared in the usual way by grading, etc., and should have been rolled to compact it to a greater or less extent; then either small broken stone, say from half an inch square to an inch and a half square was placed

directly upon the road-bed to a thickness from six inches to a foot, or a single thickness of small stones was placed loosely upon the beds so as to form a species of loose pavement, and then the broken stone was placed on this pavement. I do not think that such a roadway would be an equivalent of Nicholson's foundation when used in connection with his superstructure, but some persons have improved upon
531 theMcAdam system by the addition of a material to the broken stone, which, when the whole was rammed, so compacts the mass that it is almost impervious to water; such a roadway as this would be in my opinion be the equivalent of the foundation of Nicholson when his superstructure was placed upon it. The material which I have seen used for thus compacting the mass of broken stone was chalk; I saw it so applied in France, the only place where I saw it done.

31 x-int. As far back as the year 1840 were not the streets and highways in England almost universally either paved with stone or macadamized either upon his original, or some improved plan, and was not a mud road of that time an exception to the general public roads of that country?

Ans. I have no personal knowledge, and must answer the question from information derived from books if that be deemed sufficient; so far as I have been informed the streets of the towns aud the public roads were either paved or macadamized by the year 1840.

32 x-int. Where Nicholson's superstructure stands upon a solid or wooden foundation is not the supporting element against vertical strain found in and distributed by the foundation and not by the superincumbent blocks?

532 Ans. It is mainly, and except so far as the cementing material propogates the strain, latterally.

33 x-int. Does the value of such foundation as a support depend in any, and what, degree upon the extent to which it distributes such vertical strain.

Ans. The foundation to be within Nicholson's description must be in sufficiently large masses to afford a substaintial support for each block against the vertical strains to which it is subjected, so that the block cannot be depressed below its fellows; if this feature be attained it is a matter of no material importance how large the masses of the foundation may be so far as respects the supporting function.

34. x-int. To what extent would the vertical strain upon the superincumbent Nicholson blocks be distributed by a foundation of lime mortar or concrete, assuming by way of hypothesis that the ordinary lime mortar made from quick lime was used?

Ans. I think that ordinary lime mortar made of quick lime could not be used successfully as a foundation for Nicholson's superstructure, and that it would not be a fair construction of his specification to use lime mortar made of quick lime for that purpose. Concrete made in the usual manner of broken stone, sand, and hydraulic cement, or hydraulic lime, or of gravel and hydraulic cement, or hydraulic, lime or ground lime as it is sometimes called, would be an excellent material for the purpose, and if made of suitable thickness

533 would distribute the strain as much as would be necessary for the purposes of the pavement.

(Defendant objects to that part of answer commencing with the word "would" and ending with the word "purpose.")

35 x-int. Suppose one thickness of tarred paper of the thickness usually found in commerce be used for a foundation, would such foundation serve in any considerable degree to distribute this pressure or strain upon any particular block of Nicholson's superstructure over a greater surface than that immediately beneath the block? if so, to what extent?

Ans. The tarred paper found in commerce, that would naturally be used for the purpose, would be the sheathing paper which is tarred and applied to ships before copper or wooden sheathing is placed upon them, and is a strong, thick, and heavy paper; but a single thickness of that would probably not distribute the vertical strain upon a single block over a greater extent of surface than one larger than the block about an inch in every direction.

36 x-int. Would not ledges or sleepers, laid at right angles with and under a flooring composed of cheap boards, (such flooring being used for the foundation of Nicholson's superstructure,) assist materially in the lateral distribution of the strain received vertically on the surfaces of the blocks?

Ans. Such ledges or sleepers would assist in the lateral
534 distribution of the strains if they extended across more than one board, as I suppose to be the assumption in the question; the materiality of the assistance would depend upon the strains to which the blocks would be subjected and the nature of the flooring, for if the flooring was sufficient in itself to support the blocks against the strains to which they were subjected, the assistance afforded by the cross-sleepers would not he material.

37 x-int. If the flooring consisted merely of cheap boards, laid closely together but not in any manner fastened to each other, would the aid from the sleepers in that case be material, particularly where the substratum was loose sand or earth?

Ans. If the subsoil were marshy, I think that the cross-sleepers would afford material assistance; but if the subsoil were sand or earth, ordinarily dry, as is generally the case in streets of cities, I don't think that the cross-sleepers would afford any material assistance except when placed beneath the adjacent ends of board arranged in uniform rows, particularly in view of the fact that in the ordinary construction of the Nicholson pavement strips of boards of sufficient length to bridge over several of the flooring boards are used for the shorter blocks, and at least half of the longer blocks rest on parts of two adjacent boards of the flooring. If the board flooring was arranged to break joint lengthwise, I think that the assistance afforded by cross-
535 sleepers when ordinary earth or sand are used as the substratum would not be material.

38 x-int. In a support by dowells against vertical strain upon Nicholson's blocks, would not such strain, so far forth as it was resisted by such dowells, be borne by and distributed between the adjacent blocks and not by the foundation beneath?

Ans. Whether it would or would not, would depend upon the tightness with which the dowells were fitted, if they were fitted so tightly that no one block could be moved without the strain being immediately propagated to the adjacent blocks through the dowell pins then the strains would be distributed to the adjacent blocks until the dowell pins began to yield, when it would be taken by the foundation; whatever strain was resisted by the dowell pins would be distributed laterally among the adjacent blocks.

39 x-int. Would not such resistance of the dowell pins to the vertical strains involve an application of the mechanical power of the lever?

Ans. No, not as I understand it; the tendency would be either to sheer the dowell pins crosswise, or break it by a cross-strain in the same manner that a beam may be broken by a cross-strain.

40 x-int. Did the dowells in the wooden pavement in Green-
536 wich street, New York, keep the blocks from sinking beneath each other?

Ans. I cannot tell you; I suppose that they tended to prevent blocks that were in the line of the dowels from sinking below each other, my recollection being that the dowel pins were inserted only in one direction.

41 x-int. Is any physical change produced in a flint-stone, so far as it may be useful for paving purposes, by boiling it in tar, any more than would be produced by pouring all over it thoroughly hot tar?

Ans. Not that I am aware of.

42 x-int. In constructing Wood's patent pavement, do you understand that it would be so essential that the tar and gravel were mixed together before the gravel was introduced into the spaces between the blocks, that a pavement in all other respects like Wood's, but in which the gravel or broken stone was first introduced as a filling and the tar afterwards poured in, would be such a departure as not to be within the invention of Wood's pavement?

Ans. I think that a pavement such as is described in the latter part of the question would be within the invention of Wood, and would also embody something more than he has described; because I think that if you follow the Wood description you would naturally
537 apply the filling in a dough-like condition, without excess of coal tar or aspalt, to fill the crevices between the blocks, while if the tar were poured in after the gravel were placed in the spaces it would naturally not only concrete the gravel together but fill up the crevices between the wooden blocks and prevent the passage of water down between them.

43 x-int. Have you examined and are you familiar with the caveat or copy thereof, filed by Mr. Nicholson at the Patent Office, in relation to wooden pavements in 1848?

Ans. I have never examined either a caveat of Nicholson or any copy of one.

44 x-int. Have you examined any application for such a patent made by him at that time?

Ans. No.

45 x-int. Have you heretofore examined and are you familiar with Nicholson's original patent specifications of 1854?

Ans. I have examined a copy of the specification referred to in the question, and am tolerably familiar with it.

46 x-int. Is it not known in the art of ship-building that whale-ships are seldom attacked by dry rot?

Ans. It is.

47 x-int. Is it not a fact that it has been the practice for many years in the navy yards of America and of England to salt ships whilst they are on the stocks?

Ans. It is.

48 x-int. Is it not known in the art of ship-building that Mr. Cary, as long ago as 1785, successfully introduced a mixture, includ-
538 ing oil and salt, which operated as a powerful antiseptic when applied to the spaces between the timbers of ships while such ships were being built?

Ans. I don't know.

49 x-int. Do you consider that lime mortar of commerce, which is made from quick-lime and hydraulic cement, are equivalents for foundation of Nicholson's wooden block pavement? If not, why not? and please to give your reasons for any opinion you shall express.

Ans. I consider that such lime mortar, as is mentioned in the question, would not be an equivalent for hydraulic cement as a foundation for Nicholson's pavement, for the reason that is a soft putty-like material, incapable of performing the functions which Nicholson describes his foundation as performing in the combination of which it forms a part.

50 x-int. What thickness of hydraulic cement would be sufficient to fulfil the functions required in Nicholson's foundation by his specification?

Ans. I think that a thickness of an inch would fulfil the functions, particularly if the cement were mixed with materials such as are frequently used in connection with it when making cement flooring; but a thickness of two inches would be better.

51 x-int. Is it not a received chemical doctrine that salt applied to wood forms a new chemical compound or coagulum with the albumen of the wood, and that it possesses the quality of imperviousness to moisture?

Ans. Not that I am aware of.

52 x-int. For what purpose is salt applied to ships?

Ans. In order to prevent or impede the rotting of the timbers.

53 x-int. Is not the salt used in whaling ships the reason
539 why they are comparatively preserved from rot?

Ans. Not that I am aware of; the general theory, as I understand it, of the preservation of the timber of whale-ships is, that it is due to the fact that all of the woodwork becomes saturated with oil.

54 x-int. In your opinion, is one layer of tar paper of the ordinary thickness of sheathing paper, a full equivalent as a foundation of Nicholson's pavement for a wooden flooring?

Ans. In my opinion a single thickness of tarred sheathing paper would be a full equivalent for a wooden flooring as a foundation for Nicholson's pavement, because it would perform the same functions in substantially the same way. It would not perform the supporting function as well in degree as the flooring would, but it would perform the function of preventing the passage of moisture upwards better in degree than the flooring would.

55 int. Would not a foundation of oil silk prevent the passage of moisture from below in the same way, if not to the same degree, as tar paper, and would it not be an equivalent for a wooden flooring in Nicholson's pavement?

Ans. A foundation of oil silk would prevent the passage of moisture from below in the same way and to the same degree as tarred paper, and if it were made of sufficient thickness and the layers of it were stuck together by tar, it would be an equivalent for the wooden flooring in Nicholson's pavement, and be superior to it in all respects except as to cost.

56 x-int. How thick would the silk have to be to accomplish that result?

Ans. I never made the expériment, and I cannot tell by personal observation.

Re-direct.

By complainant:

24th int. In constructing Nicholson's foundation, according to his specifications, what would you understand by the phrase, (when he speaks of the several modes of foundation,) "or with lime mortar or hydraulic cement laid over it about two inches in thickness?"

(Question objected to by defendant as not proper in rebutting.)

Ans. to 24 re-direct int. I should understand that the person making the pavement was to make use of hydraulic cement laid over the roadway to a thickness of about two inches, so as to make a cement flooring, or that he would use a lime mortar having properties of the same character as hydraulic cement laid in the same way, such lime mortar being formed of what is commonly called ground lime or hydraulic lime, which, when set, would perform the functions which Nicholson describes his foundation as performing.

Re-re-cross.

By defendant:

57th cross-int. Is not the mortar made of hydraulic lime commonly called in commerce and among mechanics in America hydraulic cement?

Ans. No; it is a different material, and never, that I know of, had the name of hydraulic cement applied to it.

E. S. RENWICK.

Subscribed and sworn to before me, the testimony of said witness read over to him before signing, this 24th day of November, A. D. 1865.

Examination adjourned finally and testimony closed this 24th day of November, A. D. 1865.

P. A. HOYNE, *U. S. Comm'r.*

541 UNITED STATES, *Northern District of Illinois, ss:*

I, Philip A. Hoyne, a commissioner appointed by the Circuit Court of the United States and for the northern district of Illinois, in the eighth circuit, under and by virtue of the acts of Congress, do hereby certify that the reason for taking the foregoing depositions, and the fact is, that the same were taken by agreement of the counsel for the respective parties; I further certify that a notification of the time and place of taking said deposition was made out and served upon the defendant herein. I further certify that on the twenty-third day of October, A. D. 1865, I was attended by Messrs. Goodwin, Larned & Goodwin, of counsel, with the said complainant, and by Martin & Adams, of counsel, with the said defendant, and by the witnesses, who were of sound mind and lawful age; and the witnesses having been by me carefully examined and cautioned and sworn to testify the whole truth, the depositions were by me reduced to writ-
542 ing in the presence of the witnesses, who subscribed the same in my presence, and I have retained the said deposition in my possession for the purpose of transmitting the same by hand to the court for which the same was taken. I further certify that I am not of counsel or attorney for either of the parties in the said deposition and caption named, or in any way interested in the event of the said cause.

In testimony whereof, I have subscribed my name and affixed my seal, this 29th day of December, A. D. 1865.

[SEAL.] PHILIP A. HOYNE,
U. S. Commissioner Northern District of Illinois.

[5-ct. rev. stamp, cancelled.]

Endorsed: Filed Dec. 30, 1865. Wm. H. Bradley, cl'k.

On the hearing of said cause, the defendant read in evidence the following testimony and exhibits, to wit:

543 UNITED STATES, *Northern District of Illinois, ss:*

Be it remembered that on the twenty-eighth day of September, A. D. 1865, personally appeared James K. Thompson, Jno. G. Gindele, David L. DeGolyer, E. S. Cheesbrough, and Francis C. Treadwell, jr., before me, Philip A. Hoyne, a commissioner appointed by the Circuit Court of the United States in and for the northern district of Illinois, in the eighth circuit, under the laws of the United States, to take affidavits and acknowledgments of bail, etc., to testify and in truth to say, on the part and behalf of the defendant, in a certain suit or matter of controversy now depending and undetermined in the Circuit Court of the United States for the northern district of Illinois, wherein Samuel Nicolson is the plaintiff, and The City of Chicago is the defendant. And the said witness, James K. Thompson, being of lawful age, and having been by me first cautioned and sworn to testify the truth, the whole truth, and nothing but the truth, in the

matter of controversy aforesaid, did thereupon depose, testify, and say as follows, viz:

544 SEPT. 28.

1st int. What is your name, age, and occupation, and where do you reside?

Ans. My name is James K. Thompson; I am 49 years of age; I am superintendent of public works; and I reside in Chicago, Ills.

2d. int. State how long you have resided in Chicago, and how long you have acted as sup't of pub. works, and what the duties of that office are.

Ans. I have resided in Chicago about ten years. I have been in the employ of the city as ass't sup't of public works, or foreman, as they called, for about 8 years altogether, and superintendent since 1860. My business generally has been that of superintending bridges, public buildings, streets, &c.

3d int. Are you acquainted with the pavement called the "Austin" pavement, and also with the pavement called the "Nicholson" pavement? and if so, have such pavements been constructed in the city of Chicago? and if they have, state whether you have made any comparison between them, and when, where, for what purpose, and the name of parties present at the time of such comparison?

Ans. Up to July 31st, 1865, I was not acquainted with the Austin pavement, but now I am. I am also acquainted with the Nicholson pavement. They have both been constructed in the city of Chicago. I have made a comparison between them. On the 31st of July, 1865, near the N. W. corner of Clark and Randolph streets, I made
545 the comparison for the purpose of testing the durability of the two styles of pavement. There were a great many there, among whom were Gindele and Letz, of the board of public works, myself, my impression is that De Golyer was there, and many others, a crowd of bystanders.

4th interrogatory. State the manner in which said comparison was made, the mode of examination of the two pavements respectively, and the result of the comparison.

Answer. The gravel was carefully taken out of the joints until we came to the floor of the Austin pavement; we could not get to the floor of the Nicholson on account of the strips; this was done before the blocks were disturbed at all, that we might ascertain whether the gravel had worked under the blocks of the Austin pavement. We found that the blocks were resting firm and solid on the flooring; we also took blocks out of each specimen or style of pavement, and found that the wear on each was about the same.

5th interrogatory. State how many blocks of the "Austin" pavement you examined, and state whether or not any of the filling had worked under the blocks and between them and the foundation or flooring.

Answer. As near as I can recollect, we examined for about
546 three feet in length, that is, transversely of Randolph street,

and three courses of blocks in width, we found in no instance any gravel under the block, they all being firm on the floor.

6th interrogatory. State if you know of any circumstances which would prevent the experiment of the Austin pavement at the place mentioned being a fair test as to whether the filling or gravel would work underneath the blocks and between them and the foundation or flooring.

Answer. I know of none.

7th interrogatory. State if you know the superficial dimensions of the piece of Austin pavement, laid at the place mentioned, and the directions of the said piece. State also the appearance of the surface of the said piece of pavement, and how such appearance compared with the surface of the so-called Nicholson pavement lying contiguous to it.

Answer. Of my own knowledge I do not know the superficial dimensions of said piece of pavement; it lies at right angles to the direction of Randolph street. My impression at the time was, and still is, that the general appearance of the surface was equal to, or superior to, the so-called Nicholson pavement.

8th interrogatory. State what was the appearance of the
547 Austin pavement at said place as to smoothness and equality of surface, or the reverse.

Answer. The appearance of the surface was that of a firm, solid pavement, the wear about equal in all portions of the same, so as to leave the surface even.

9th interrogatory. Did you make a comparison between the two pavements aforesaid as to their firmness, compactness, and solidity? if so, state the result of such comparison.

Answer. I did make the comparison; from that comparison I was satisfied that the Austin pavement was more firm and solid than the other, from the fact of their being a solid mass of gravel in the one, while the other joints was composed of strips of mud and gravel.

10th interrogatory. State if you are acquainted with Nicholson's method of practising his alleged invention, in which he uses strips of boards between the rows of blocks, and resting upon the foundation or flooring, and fills the cells or channels above these strips with gravel or broken stone, and tar or pitch, and if so, state whether in your opinion the use of the strips of boards as aforesaid, instead of the concrete, conduces to the utility or increases the usefulness or durability of the pavement, and the reasons for your opinion.

Answer. I was acquainted with what is said to be his mode
548 of lying it down with strips, and gravel, and tar, &c. In my opinion the use of the strips does not increase the utility or durability of the pavement, from the fact that on almost every street that has been made in that manner the strips have worked up to the top of the blocks which would leave no gravel in the joints, and must necessarily leave a space between the strips and flooring. I don't know of any other reason why I would object to the strips.

11th interrogatory. Suppose the filling between the parallel rows

of blocks to consist of partly of strips of boards, as in the so-called Nicholson method, and partly of a filling of broken stone, or gravel, and tar or pitch resting on these strips, would this make a pavement as compact and solid as if the filling consisted wholly of the concrete made as aforesaid?

Answer. In my opinion it would not.

12th interrogatory. Suppose a pavement, constructed in the so-called second method of Nicholson pavement, wore down to the surface of the strips of boards, and suppose an Austin pavement, constructed originally of blocks of the same depth with the other, and wore to an equal depth from the surface of the blocks, which pavement would in your opinion [would] be the most useful for the practical purposes of a pavement, and state the reasons for your opinion.

549 Answer. In my opinion the Austin pavement worn to that depth would be the most durable, and of course the most useful it being more durable than the other, from the fact that between one is a solid mass of gravel, and the other simply pine strips or boards.

13th interrogatory. Suppose a pavement constructed and worn down as stated in the preceding interrogatory, which would be the best for the purpose of horse travelling, and why?

Answer. My impression would be, that a horse would be less likely to slip where there was gravel than they would be where the whole surface was wood simply, because the surface of gravel would be more rough than wood.

14th interrogatory. Have you in your possession any blocks taken up at the time of the comparison alluded to by you was made? if so, produce them and identify them.

Answer. I have such blocks and produce them. The one marked with a "C," cut in the edge, and a card tacked on it upon which is written. "July 31st, 1865. Nicholson. 7 ft. from corner Clark and Randolph, on Clark. J. K. T.," in the handwriting of myself, is the block taken as endorsed upon said card; and the block marked "R," cut on the side, and a card tacked on said
550 block, upon which is written in my handwriting, "July 31, 1865. Austin. 7 feet from corner of Randolph and Clark, on Randolph. J. K. T.," and the block marked with a card tacked upon it with the same writing as on preceding block, and with said preceding one constitute the whole block taken up as aforesaid, as endorsed upon said block each of these cards; one endorsed with the initials of the commissioner, and numbered one, two, and three consecutively.

15th interrogatory. State if since July 31, 1865, you have made any further comparison in said pavements; and if so, when and how, and the result of such comparison.

Answer. I made a comparison about the 20th Sept., 1865, at the northwest corner Clark and Randolph, by taking up portions of the blocking in a mass together, including the flooring; the flooring was taken up by cutting the boards in two; the comparison did'nt change

my opinion in regard to the durability of the pavement from the former investigation.

16 Int. State at what places in the street the masses of blocks of the two pavements respectively were taken up, the dimensions of the masses respectively, the appearance of the surfaces of the pavements, and whether any of the filling of gravel or broken stone, etc., had worked underneath the blocks of the Austin pavement and between them and the flooring.

551 Ans. The mass on Randolph st. of the Austin pavement was taken up about 12 feet from the north curb line of Randolph st., and about 14 feet east of the west line of Clark st.; the mass taken up was 18 inches by 24 inches. The Nicholson pavement was taken up about 12 feet from the west curb line on Clark st., and about 3 feet south of the north line of Randolph st., the dimensions of the mass being about the same. The appearances of the Austin pavement was equal if not superior to the other. I could not discover any of the filling between the blocks and the foundation in the Austin piece.

17 int. State whether the places at which the said specimens were taken up were places much exposed to public travel, and whether equally so exposed or otherwise.

Ans. They were each of them places so exposed; my opinion would be the travel was greater on the Nicholson than on the Austin, from the fact there is usually more travel on Clark st. than on Randolph st.

18 int. State as near as you can the distance between the places at which said specimens were taken up.

Ans. According to the best of my judgment, the distance was 30 feet.

552 19 int. State whether the place referred to on Randolph st. is much exposed to public travel, and what houses are adjacent to it.

Ans. It is, as I said before, much exposed to public travel, the Sherman House being adjacent to it.

20 int. You have stated, in answer to int. 10, that strips of boards laid between the rows of blocks in the Nicholson method have worked up to the top of the blocks and thrown out the filling; state whether this is the result of actual observation by you, and if so, when it occurred.

Ans. It is the result of actual observation; I have seen it on Clark st., Lake st., and on Wells st., in this city.

21 int. State whether you are a mechanic, and if so, what is your trade.

Ans. I am a mechanic; my trade is carpenter and joiner.

22 int. Have you ever seen any wooden pavements except those constructed in this city; if so, when and where?

Ans. I have never seen any elsewhere constructed as they are here. I saw a wooden pavement in New Orleans constructed the same, with the exception of the gravel between the blocks; they were made of hexagonal blocks; the foundation was made by laying about 3

553 by 6 timbers parallel with the direction of the street, (objection; plaintiffs object to any testimony in regard to any paving not referred to in defendant answer,) [Ans.] the spaces between being filled with sand or gravel, and plank placed transversely cross the sleepers upon which the blocks rested.

23 int. Do you know anything farther in reference to the pavements mentioned or their comparative merits, which would be beneficial to the defendant in this case? if so, state it.

Ans. I don't recollect anything further than what I have already stated.

24 int. State if you know what the difference is in fact, if any, between the Austin pavement and the so-called Nicholson pavements, and whether such difference is a difference in the principle of the pavements or a difference in the construction.

Ans. All the difference I know of is, the Nicholson has strips of wood between the blocks to one-half their heighth and the balance of gravel, and the Austin has no strips, and the space between the blocks filled with gravel entirely. In my view there is no real difference in the principle, but simply in the construction, the surface of each pavement when finished being precisely the same.

554 25 int. Have you examined the blocks taken up in the last comparison made by you, as aforesaid? and if so, state whether there was any perceptible difference in the wear of the Austin and Nicholson blocks respectively; and if so, how much.

Ans. We examined them; found no perceptible difference between them, that is, no more difference than there might have been when they were put down; some of the Nicholson blocks appear to be worn more than others, and some vice versa.

26 int. Have you a drawing of the intersection of Randolph and Clark sts., showing the places where the comparison spoken of by you was made, and from which the pavement blocks were taken? if so, produce and explain it.

Ans. I have such a plat, and here produce it; the map explains itself.

Cross-examination.

1 x. By whose request and direction did you make the examination and comparison of paving alluded to in your direct examination?

Ans. At the request and direction of Mr. Martin and Mr. Adams.

2 x. Were you directed to make the same by the board of public works, or any of its officers?

555 Ans. The matter was laid before the board; they fell in with the design.

3 x. Were you aware at the time said examination and comparison were made that a suit was pending between the city and Nicholson, involving the said Nicholson paving, and in which such so-called Austin paving would be a subject of inquiry?

Ans. I was so informed by Mr. Adams, which was the first intimation I had of it.

4 x. Were you aware that the examination and comparison you

made were to be made evidence on the trial of such case; and were the blocks you have produced marked and preserved by you with reference to their identification and use as such evidence?

Ans. I was, and they were.

5 x. Was any person representing the interest of the plaintiff Nicholson present, or invited to be present at the time said examination or either of them were made, or had the plaintiff, his agents or attorneys, to your knowledge, any notice or knowledge of such examination or either of them?

Ans. There was no such person present that I know of, neither had they any notice that such examination was to be made that I
556 am aware.

6 x. Have you since said examination had any conversation concerning them with any one representing the interest of the plaintiff before you were called to testify as a witness in relation to the same; if yes, when, where, and with whom?

Ans. I never had any conversation with any one representing the interest of the plaintiff on the subject.

7 x. Did you refrain from making any such statements or giving any information to the plaintiff or his attorneys concerning such examination in pursuance of any caution, intimation, suggestion, or request to that effect from the attorneys of the city, or from any of its officers?

Ans. I have never been spoken to on the subject, one way or the other, in relation to keeping it a secret.

8 x-int. Are you familiar with the specifications and drawings of the patent of Henry Austin for wooden paving, so that you can state the essential portions of the specifications and of the claims contained in said patent?

Ans. I am not; I never have seen either of them.

9 x. How then do you know that the piece of paving at the
557 intersection of Clark and Randolph sts., which you designate as the Austin paving, is laid according to the specification of the Austin patent, or what reason have you for calling it the Austin paving?

Ans. I have no knowledge myself of its being laid according to the Austin patent or plan; I took it for granted the piece of pavement called Austin's pavement was admitted by both parties to be the Austin patent.

10 x-int. What proportion of the whole of the so-called Austin piece was taken up and examined?

Ans. About 1-60 part.

11 x-int. You say two or three rows of blocks were examined at the first examination for about the distance of 3 feet in length; about how many blocks did this include?

Ans. About 8 or 9 blocks.

12 x. About how many blocks of the Nicholson were examined?

Ans. Perhaps not more than 4 or 5 blocks.

13 x-int. About how many blocks of each were examined on the 2d examination?

558 Ans. About 12 or 15 of each.

14 x. You say that the travel over the Nicholson at the point of examination was greater than that over the so-called Austin. Was not such travel very much greater over the Nicholson; and does not, in fact, all of the Randolph st. travel at this point, either up or down the street, pass over Clark street, in addition to the direct travel on Clark st. itself; and is not the direct on Clark st., irrespective of that which comes on to it from Randolph, much greater than the direct travel to and from Randolph?

Ans. It was considerably greater over the Nicholson. A large portion of the travel passing from Randolph st. into Clark would pass over that point where the Nicholson paving was taken up, and a large portion of the Clark st. travel turning into Randolph st. would pass over the point where the Austin pavement was taken up; that would perhaps about balance so far as the turning is concerned. The direct travel on Clark is considerably greater than the direct travel on Randolph st.

15 x. The opinion which you have given in reference to the Austin and Nicholson pavements, in your answer to the 24th direct int., and to the principles of each, is based, is it not, upon what has been told you as to which was the one and which was the other, and without any knowledge, study, or investigation of the specifications and drawings in the respective patents?

559 Ans. I would state that in regard to the Nicholson I had a perfect knowledge of the principles of its construction from information gained from Mr. Nicholson himself, up to the time of the examination made by me. I was not aware that any such pavement as the Austin pavement was in existence. It was based upon those facts that I have been told, and without knowledge of the specifications in the respective patents.

16 x. For what length of time, in your opinion, would a pavement formed of wooden blocks 6 inches in depth, and laid so as to form channels filled with gravel, stone, and tar, last, before the blocks composing it would, by rot, displacement, wear, and other causes, become loosened, broken, or unserviceable for public travel, the pavement require to be relaid.

Ans. In some localities it would perhaps last 10 years; in others not more than half of that time, so far as my experience goes.

17 x. How long has the piece of Nicholson pavement on Wells st., between S. Water and Lake, adjoining to the middle of the block between said two streets, been laid?

Ans. I think about 9 years.

18 x-int. Is it not, in your judgment, a matter of essential importance, in a wooden block pavement combined with a gravel and

560 stone filling, that the gravel and stone should be prevented from working beneath the blocks by which such pavement is formed.

Ans. It's very important the pavement should be laid so the stone or gravel should not work under the blocks.

19 x-int. Would not any mode of laying a paving which, in extended use and practice was found liable to this defect, be objectionable;

and would not an arrangement of the blocks which would entirely obviate such a liability be important to the durability and usefulness of the paving?

Ans. It would.

20 x-int. Have you ever seen any wooden block paving constructed after Nicholson's 1st method, that is, with blocks instead of strips and channels for the filling, running longitudinally as well as transversely; and if so, where?

Ans. I have seen a small piece of such at the intersection of Washington and Clark sts., in this city.

21 x-int. Does the objection which you mention in your answer to the 10 direct int., with respect to the use of the strips, apply at all to the pavement constructed after that 1st method?

561 Ans. It does not.

22 x-int. Of what length are the strips which you referred to as working up?

Ans. Four feet in length.

23 x. State whether the turning over or abrasion of one of the edges of the block of the Nicholson, produced by you, marked C, was the result of the natural wear or injury to the block by the cross-bar or other tool used in prying it out from its position in the street.

Ans. My impression is the principal abrasion was caused by the pick or crowbar.

24 x. In your answer to the 24 direct int. you say that the Nicholson has strips of wood between the blocks to one-half their heighth; do you mean to say that there is anything in Nicholson's specifications or invention which requires the said strips should be one-half the highth of the long blocks, or nearly that that is the height at which you have known them to be made in pavements which you have observed?

Ans. I am not aware that there is any given depth; principally in all the pavements which have been laid down here 3 inch
562 strips have been used, whether by direction or not I do not know.

Re-direct examination.

1 re. int. Do you remember whether or not at that first examination the comptroller, Mr. Letz, Mr. Gindele, Mr. Rose, and such a large crowd of other spectators were there, that they so surrounded those engaged that it was difficult to get room to work in? and state what hour of the day it was.

Ans. I can't be positive as regards the three commissioners and the comptroller, but think they were there; but that there was a large crowd around I remember well. It was about 10 or 11 o'clock in the morning.

2 re. int. Explain the construction of the piece of paving which you examined and now called the Austin paving, and state whether or not it had any wooden foundation, and how that foundation com-

pared with the foundation generally used for the so-called Nicholson pavement in Chicago; state also whether there was any difference in the size, form, or materials of the blocks or in the spaces produced by the placing of the blocks, or in any other particular than in the filling between those blocks.

Ans. The construction was: The blocks were placed an inch apart and nailed to the flooring, the whole space between these
563 blocks filled with gravel, there being no strips between the blocks; in all other respects the preparations for laying the floor for receiving the blocks was precisely the same as the Nicholson, the floor and blocks being the same material in the two kinds; the blocks stand precisely in the same way and presented precisely the same surface, and the blocks the same size and form, and the concrete filling to the strips the same in both.

3 re. int. In making your first examination, did you take up or examine more of one kind than the other of pavement?

Ans. My impression is I did. From this I wanted to satisfy myself perfectly that there was no gravel under the block of the Austin pavement. The only object in taking up the Nicholson was to compare the durability of the two.

4 re. int. How does that intersection of Clark and Washington compare for durability and utility with the Nicholson pavement so-called in Chicago?

Ans. In what I've seen of it, it does not compare favorably at all. It does not keep its position as well as the other; it seems to be more liable to settle than the other. I think it will wear out sooner than the other.

SEPT. 29.

5 re. int. How would a pavement constructed upon the method of said intersection of Clark and Washington streets stand if, after the earth was graded in the usual method of preparing it for
564 the reception of such pavements, a foundation of tar paper were used in the place of the wooden floor or foundation which is usually made?

Ans. My impression would be that it would not stand the pressure of the teams passing over it, from the fact there is no solidity in the sand filling as it's usually put in.

6 re. int. How would a pavement on Nicholson's 1st method stand in point of slipperiness when the long blocks had worn down to the short ones?

Ans. It would be just as objectionable as to make the blocks all of the same length in the first place without any filling between them.

Re-cross-examination.

1 re-x. Please state whether the flooring laid beneath the so-called Austin pavement was tarred on one or both of its sides, and which.

Ans. The piece I took out was tarred on both sides, and I presume the rest were in the same condition.

2 re-x. Please state at what points in this city wooden block pavements are now being constructed, and on what points they have been ordered to be constructed, as far as you are advised.

565 Ans. It is being constructed on South Dearborn st., between Monroe and Madison, on Wolcott st., between Kinzie and Michigan, on Wabash av., between Randolph and 22nd st.; that is all now in course of construction. Contracts have been let for Michigan st. from Clark to Cass, I think; to be executed this fall. I know of no further orders. I have an impression of another piece ordered, but do not know where it is. I think it is from Clark to Wells, on Van Buren, in the south division, but am not quite certain.

Re-direct.

1 re-int. Would it make any material difference in the principle of the pavement, whether its flooring was tarred or not?

Ans. My impression would be it would not.

Re-cross.

3 re-x. Be so good as to state what you understand by the principle of a pavement?

Ans. In my answers to the questions where the principles are spoken of, I mean the principle as claimed by the patentee, as I understand it.

566 4 re-x. In the case of the Nicholson pavement, I understood you [you] to say you had never examined or studied the specifications or claims of the patentee, but were acquainted with his method of paving only, as you had seen it being constructed in Chicago and informed by individuals as to the method of the construction; is not that correct?

Ans. Yes.

5 re-x. How then can you undertake to state what is or is not the principle of the Nicholson pavement, as claimed by the patentee?

Ans. I state, as I did before, I got my information from Mr. Nicholson; that is, the manner of putting it down, and the materials used is the principle; and he informed me as to the manner of putting it down and the materials used.

Re-direct.

OCT. 4.

8 re-d. Have you, since your last examination, taken up a specimen of the Austin pavement and so-called Nicholson pavement in the city of Chicago? if so, when, where, who was present, and if you have such specimens in court produce them here?

Ans. I have; on the 29th day of Sept., 1865, near the N.W. corner of Randolph and Clark sts., beside a large No. of spectators,

567 E. C. Larned, esq., S. A. Goodwin, Mr. Martin, Mr. Adams, Alderman Bond, and others were [were] present; the place where the specimen was taken out is marked "A," on map

marked "A;" the specimen is produced and marked "A;" this piece produced contains specimens of both pavements referred to.

9 r-d. Have you, since taking up said last-mentioned specimens, made, or caused to be made, a map, showing the section of Austin pavement laid at the intersection of Clark and Randolph streets? if so, produce, mark, and explain it?

Ans. I have, and here produce it, marked "Ex. map B;" the map explains itself, with the exception of the place from which the specimens produced were taken, which place is marked "A" on the map.

10 re-d. Was that piece of paving taken up with any, and how much, care? Does it contain equal portions of each kind of paving? Is it a fair specimen of each pavement as you found them there, and as they now exist in that intersection?

Ans. It was taken up very carefully; the portions are nearly equal, being a little more of Nicholson than Austin. I consider it a very fair specimen of the pavements as I found them there, and as they now exist.

11 re-d. Have any nails been driven into it or pieces of
568 boards nailed to it while it was being taken up or since? if so, when, for what purpose, and please to indicate where they are in the specimen?

Ans. Before being taken up 4 nails were driven into the outside blocks of the Austin pavement for the purpose of fastening the blocks to the flooring; also driven into the strips, nailing to the block and to the flooring of the Nicholson pavement with thin pieces of board nailed on either end of the specimen for the purpose of retaining the gravel; also two pieces of board nailed on top of the block for the purpose of keeping the mass together, and one nail driven into the bottom.

Re-cross.

6 re-x. State whether the piece of so-called Austin pavement, from which said block was taken, was a portion of the same piece laid down by DeGolyer?

Ans. I suppose it was.

7 re-x. The said DeGolyer, in his testimony in respect to the said so-called Austin piece of pavement, describe the location and dimension of the said piece as follows: "The location is between the horse R. R. track on Randolph st. and the north curb line of Randolph st. adjoining the Sherman House; it is about 16 feet by 26 or 28; it was the west wing of the intersection; the blocks were laid from
569 the curb line of the street to the horse R. R. track." State whether such description of the location and dimensions of the said so-called Austin piece of pavement was found by you to be correct or otherwise; and if not correct, state in what respects the same was found to be erroneous.

Objection. (Objected to, first, the question is improper in the cross-examination of this witness; 2d, the witness was recalled, and by agreement of counsel was to be confined to the explanation of the maps and specimens. Question withdrawn.)

8 re-x. State whether any portion of the said so-called Austin piece of pavement abutted on the north curb of Randolph st., or whether any portion of the same abutted on the horse railway track, and whether the said piece occupied the whole of the west wing of the said intersection; and if not, describe what portion of the same was occupied by it, and with what description of pavement the rest of the said west wing of said intersection was paved?

Ans. As far as my investigation went, I found no Austin pavement abutting on the north curb line of Randolph st., or abutting on the horse R. R. track; it did not occupy the whole of the west wing of said intersection, a part only of the east half of said west wing, comprehending a piece 17 feet 9 inches long by 5 9-10 feet in width. I found by investigation the balance of the west wing was paved
570 with the so-called Nicholson pavement.

9 re-x. State whether all of the so-called Austin pavement which you found in the said west wing of the said intersection is represented on the 2 maps produced by you, marked "A" and "B;" and if so, how.

Ans. On map "A" the Austin piece is represented. It commences at a point 4 feet north of the R. R. track, and extends north 17 feet 9 inches; thence east on a line 3 feet 9 inches distant from the curb line, and parallel therewith 5 feet and 9-10 of a foot; thence south on a line 1 8-10 feet west of the west curb line of Clark st., and parallel therewith 17 feet and 9 inches; thence west 5 9-10 feet on a line parallel with said railway track, and four feet therefrom, to the place of beginning.

10 re-x. Did you find the said so-called Austin piece of pavement you have described and thus located on the map, bounded on the north, east, south, and west by the Nicholson pavement?

Ans. I did.

11 re-x. Did you cut the said specimen you have produced, marked "A," from a continuous board flooring, upon which the blocks of both kinds of pavement rested?

Ans. I did.

571 *Re-direct.*

12 re-d. Is there anything called for by the 3, 4, and 5 cross-int's which is not readily apparent by a simple inspection of the maps and the explanations therein written?

Objection. (Objected to as impertinent and irrelevant.)

Ans. I know of nothing but what is fully explained therein.

J. K. THOMPSON.

572 *Deposition of J. G. Gindelle.—No. 1, "G."*

SEPT. 30,

John G. Gindelle being first duly sworn, deposes and says:

1 int. What is your name, age, residence and occupation?

Ans. My name is John Gindelle; I am 52 years of age; I reside in Chicago, Ills; I am commissioner of the board of public works.

2 int. What is your proper business, and how long and in what places have you practiced it?

Ans. My proper business, in Germany, was civil engineer. I was city engineer during 12 years in a manufacturing city in Bavaria; the name of the city was Schweinforth. I was on the Ludwic, Danube, and Mein river canal, in Bavaria. I was there one year, and I was three years on government buildings in Bavaria, in Kissingen. I came to this country in 1850. I was engaged in Wisconsin as partner in a flour mill; I quit that business in 1852 and came to Chicago. I was employed in "Illinois Stone Dressing Company" a short time as carver, then as foreman, then 3 or 4 years as superintendant, and interested in the business. I commenced business for myself in 1859 as a builder and stone cutter, and builded a part of the Chicago University at Cottage Grove. In 1861 I was elected commissioner of the board of public works in Chicago and have held that office
573 ever since.

3 int. Have you during that time, if so, when and how long filled the office of president of the board of public works of Chicago?

Ans. I am president of the board of public works since April, 1863.

4 int. Please to examine deft's Exhibit "G," which purports to be a specification of the patent of Henry Austin, and state whether or not you'r acquainted with the materials used as therein described, and the method of constructing that kind of his pavement in which oblong blocks may be laid together without intervals or spaces between the ends, but forming parallel lines and intervals in the lengths only to be filled in as therein described; and are you also acquainted with that instance of Nicholson's 2d method in which he uses a board foundation?

Ans. (Counsel here puts into witness' hands the Austin specification marked Exhibit 'G," which the witness reads and examines and says:) I am acquainted with this document laid before me, and which contains a description of Austin's improvement of wood pavement. I am also acquainted with the model or specimen of this improvement given in a small scale, showing the construction of his pavement. I am acquainted with the instance referred to, of Nicholson's 2d method.

574 5 int. How long have you been acquainted with the Austin method referred to by you?

Ans. I am acquainted with Austin's improvement since I have seen the mentioned document and model; this may be about a year ago.

6 int. Between the 2 methods of paving referred to by you, that is, the Austin and Nicholson, is there any, and if so what, essential difference in the grading of the road-bed, or in the construction of the board foundation or support?

Ans. There is no difference.

7 int. Between the same two methods is there any, and if so what, difference in the size or form of the blocks, or in the way in which they stand upon the flooring, so as to form rows of blocks; and is there any, and if so what, difference in the space or channels made between such blocks by so placing them in rows?

8 re-x. State whether any portion of the said so-called Austin piece of pavement abutted on the north curb of Randolph st., or whether any portion of the same abutted on the horse railway track, and whether the said piece occupied the whole of the west wing of the said intersection; and if not, describe what portion of the same was occupied by it, and with what description of pavement the rest of the said west wing of said intersection was paved?

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Ans. I did.

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Ans. I did.

571 *Re-direct.*

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Objection. (Objected to as impertinent and irrelevant.)

Ans. I know of nothing but what is fully explained therein.

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3 int. Have you during that time, if so, when and how long filled the office of president of the board of public works of Chicago?

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574 5 int. How long have you been acquainted with the Austin method referred to by you?

Ans. I am acquainted with Austin's improvement since I have seen the mentioned document and model; this may be about a year ago.

6 int. Between the 2 methods of paving referred to by you, that is, the Austin and Nicholson, is there any, and if so what, essential difference in the grading of the road-bed, or in the construction of the board foundation or support?

Ans. There is no difference.

7 int. Between the same two methods is there any, and if so what, difference in the size or form of the blocks, or in the way in which they stand upon the flooring, so as to form rows of blocks; and is there any, and if so what, difference in the space or channels made between such blocks by so placing them in rows?

Ans. From what I have seen in the description of Austin's improvement, and from the wooden model, I cannot find any difference in the size of the blocks as generally used nor in the setting of the blocks on the floor, with the exception that the blocks in Austin's improvement are cemented or fastened otherwise to the floor; the
575 spaces between the blocks in a lateral direction, (I mean crosswise with the street,) are in Austin's improvement of the width of an inch and a half or thereabouts, to the entire depth of the blocks; the spaces in the Nicholson pavement in this city are one inch wide through the whole depth of the blocks, but in this space there are wooden pickets put on the floor in a vertical direction or edgeways; the pickets are from 3 feet 8 in. to 4 feet long, 3 inches high or wide, and one inch thick. The form of the blocks are oblong.

(Objection.—Plaintiff's counsel objects to witness testifying in regard to a model which is not produced or identified in any form and to the above testimony in regard thereto.)

8 int. Have you ever seen any pavement constructed on the principle of the Austin specification; if so, when was it, and how much was there?

Ans. I saw one what was told to me to be Austin's improved pavement on the intersection of Clark and Randolph sts. and front of the Sherman House; it was done by Mr. DeGolyer. When I saw 1 year after the document I referred to, (Exhibit "G.") I was convinced or satisfied that that piece of pavement, called by DeGolyer Austin's pavement, was constructed according to the desecription in Austin's patent or Austin's improvement, with the exception that the
576 blocks have not been cemented on the floor and the fastening was done by nails.

9 int. Please for the present to lay out of your mind any of the filling between the blocks, and state whether without reference to such filling there is any difference, and if so what, in the spaces which are produced between the rows of blocks in the two methods respectively; confine your answer to what your have read in the specifications, and what you have learned by experience, without regard to the model in respect of which objection has been made.

Ans. There is no difference about the filling in the spaces of both pavements, except that the spaces in the Nicholson pavement on account of the pickets are only 3 inches high.

10 int. Please to lay out of your mind anything which may be filled or inserted between the blocks, and state whether there is any difference, and if so what, in the spaces or channels formed by the rows of the blocks.

Ans. I don't fully understand that question. (Counsel asks to have it re-read more distinctly and more loudly to the witness so that the witness may understand it.) [Ans.] I think I answered that question when I spoke about the filling of the spaces between the blocks.

577 11 int. The question asks you to disregard the filling and the wooden pickets, and to answer only as to the spaces produced

by the rows of blocks. Please to state if no such pickets or filling should be inserted, whether there, is any, and if so what, difference in the spaces between the rows of blocks in the two methods of paving referred to.

(Counsel here asks in connection with this question to have the questions and answers 9 and 10 re-read, which is done.)

Ans. There would be no difference.

OCT. 2.

12 int. Between the 2 methods of pavement referred to by you, that is, the Austin and Nicholson's 2d method, as you understand them, is there any, and if so what, difference in the filling up of the spaces formed between the rows of blocks?

Ans. The description of Austin's improvement of wooden block pavement contains several modes of filling the spaces between the rows of blocks, among which is one composition of tar and gravel, the same as is supplied at present in the use of the filling of the spaces of Nicholson pavement.

13 int. Does Nicholson's 2d method insert anything else besides tar and gravel between the blocks? If so, what is it?

Ans. As I already mentioned in the foregoing question,
578 there is inserted between the spaces of the rows of blocks in the Nicholson pavement a wooden picket put in edgewise, 3 inches high and one inch thick.

14 int. With the exception of such wooden picket, is there any, and if so what, difference in the filling of the spaces between the blocks, in the 2 methods of paving referred to?

Ans. There is no difference; of course, if the pickets are taken out or not inserted, the space of the fulamen is filled with something else, the same stuff what is above, as has been filled in around the pickets.

15 int. Please to explain what you mean by the word fulamen?

Ans. I mean by the word volumen a certain body of a certain cubic measure?

16th int. Does the English word volume cover it?

Ans. I have no doubt of it.

17 int. Is the difference of a strip filling so much space between the rows of blocks, instead of the like quantity of tar and gravel, a difference of principle between the 2 pavements, or is it a difference in mechanical construction? and if you say there is any differ-
579 ence in principle between the 2 pavements, explain what that difference in principle consists of.

Ans. I cannot consider the difference in filling the spaces by inserting the strip in the Nicholson pavement, compared with the filling of the spaces in the Austin pavement a difference of the principle—the principle of both pavements; but I would not prefer the Nicholson's pavement with the strip inserted into the spaces, without fastening those strips with nails to the blocks, as I and some of my associates, and the sup't of board of public works. Mr. Thompson, and some other persons, have made the experience, convinced our-

selves that; and the first Nicholson pavement laid in Wells street, between Lake and South Water, on examination, about 3 years ago, the strips between those rows have been found partly upon the surface of the pavement; we found that that they had not been nailed or fastened to the block; as those pickets or strips are straight, and from 3 feet 8, to 4 feet long, as mentioned in another question, do not conform with the crown of the street, which crown is in a certain curb, there must be a space left between the curb and between the pickets; it is a natural thing; it must be a natural consequence, the consequence of that difference, that the pressure of the teams would keep those straight pickets on a curve under ground or foundation in more or less motion.

580 18 int. Have you examined the wooden pavement in the west wing of the intersection of Clark and Randolph st., in which there is no strip in the blocks? If so, state if you know in whose method that piece of pavement was constructed.

Ans. I answered a part of that question in my answer to the foregoing question, but I wasn't asked about the difference of the utility. I have examined that pavement; I must say as I already have mentioned you now, that the pavement was constructed according to one of the method of the Austin's improvement, as described in a pamphlet shown to me.

19 int. Please to refer to def'ts Exh. "G," and state whether or not that is the pamphlet referred to in your answer.

Ans. The pamphlet shown to me, Ex. "G," is the pamphlet referred to.

20 int. Does toe-nailing the blocks to the foundation instead of glueing or cementing them make any difference in the principle of the pavement, or is it a difference in the mechanical construction only? If it makes any difference in the principle, explain what that difference in principle is.

Ans. There is no difference in principle, to my best know-
581 ledge. The difference is in the construction.

21 int. How does a pavement constructed as that one of Austin's methods you have referred to compare in point of durability, utility, and all the other practical purposes of wooden block pavement with a pavement constructed according to Nicholson's 2 method with the strip inserted edgewise between the blocks, but not nailed or otherwise fastened there, except by the tar and gravel?

Ans. In one of my answers in a different question, I mentioned that we would not use the Nicolson's pavement as described, without nailing the strips to the block, because we have made the experience that those strips not nailed to the block will raise up to the surface, detrimental to the pavement in general. With the exception of that defect, which I consider very important, the balance of both pavements I consider of an equal durability and utility.

22 int. The last question had reference solely to Nicolson's method, without the strips being nailed; please to answer how such a pavement, without the strips being nailed, would compare in point of durability and utility, and all the practical purposes of a wooden

block pavement, with that one of the Austin's method to which you have referred.

582 (Defendant's att'y asks that int. No. 21 and its answer may be read to the witness in this connection.)

Ans. Without nailing the strips in the Nicolson pavement, I should prefer the pavement known as Austin's pavement.

23 int. Please to refer to the specification of Nicolson's 2d method, and state whether that description provides for anything more than a mere insertion edgewise between the blocks; and whether, in constructing a pavement strictly according to that specification, it is necessary to nail the strip to the blocks or to the flooring.

Ans. The specification of Nicolson pavement does not refer or indicate that the strip should be nailed either to the blocks or to the foundation. I consider, as already mentioned, that it is necessary to nail those strips to the blocks to prevent their raising up to the surface.

24 int. Do you mean that it is necessary to nail the strip in order to strictly comply with Nicolson's specifications of his 2d method?

Ans. In the foregoing answer, I said that I could not find in the specification of the Nicolson pavement, that the strips should be nailed; but experience has shown to me that it is absolutely necessary.

283 25 int. Do you or not regard the nailing of the strips as an essential principle in the production of a useful wooden block pavement, or do you regard it merely as a change in the mechanical construction of Nicholson's method?

Ans. I consider the nailing of the strips to the blocks as an essential principle of the pavement, and not merely a change in the mechanical construction.

26 int. What is the office or purpose of the wooden flooring on which the blocks all stand?

Ans. The wooden flooring, as a foundation, will give more assistance against the pressure, and distribute the same more equally, what would not be the case if every single block had to rest for to sustain that pressure on its own surface.

27 int. Does such flooring in any way, and how, and to what extent supports the pavement constructed upon it?

Ans. I answered that in the foregoing question.

28 int. Please to be so kind as to answer now whether it does, or does not, support, the pavement, and how and to what extent?

Ans. It supports the pavement; it can be regarded as the finished shape of the foundation of the street.

584 29 int. How would a foundation of tar paper only, instead of wood, answer the office or purpose of a wooden foundation?

Ans. I have no experience of such a foundation under a wooden pavement, but I think a wooden foundation will be more durable.

30 int. Would or would not a foundation of tar paper only, instead of wood, answer the office or purpose of the wooden foundation, in your judgment?

(Objection. Objected to. Witness has stated in his former answer

that he has had no experience in respect to the foundation enquired of.)

Ans. I had mentioned I had had no experience of such a foundation in a wooden pavement, but I am fully assured that the paper foundation would not give so much assistance as a wooden foundation.

31 int. Please to examine Nicolson's specification of his 1st method; also examine Crannis and Kemp's specifications, (Ex. "F," folio 30 & 35, page 3;) also his drawings, (sheet "B," fig. "19; also sheet "A," fig. 17,) and state whether there is any, and if so, what, essential difference in the two specifications, in the method of forming cells by the arrangement of alternate long and short blocks?

(Witness having examined the specifications, as desired by the question, says:)

585 Ans. The foundation in Crannis & Kemp's specification is of wood, consisting of boards and stringers. It's somewhat complicated, compared with Nicholson's and Austin's method. The wooden blocks, as shown in fig. 17, 18, and 19, are oblong, the same as in Nicholson's and Austin's pavements; but the blocks in each course break in joints, not running parallel as in Nicholson's and Austin's, not forming continuous channels; but between the blocks running longitudinally the joints or spaces are left open, as indicated in the plan, which spaces are filled up with strips or small blocks about one inch in thickness, and one inch lower—the thicker blocks. This pavement has much similarity with the Nicholson pavement, except irregular spaces, as indicated and already mentioned, and higher strips.

32 int. Please to look again at Nicolson's 1st method, not his 2d, and state whether by that 1st method the spaces do or do not break joint; and whether, by that 1st method, the spaces do or do not form continuous rows or channels.

Ans. The blocks of Nicolson pavement in the 1st method don't break joints, but every alternate block is 4 inches lower; and thus forming cells, they are continuous rows, but every alternate block lower.

33 int. Please to confine your attention simply to the mode of making cells by the alternate arrangement of long and short
586 blocks in the two specifications referred to, and state whether there is any, and if so, what, essential difference in their method of forming such cells.

Ans. The 1st mode of Nicolson's pavement contains far more space for the cells in a certain area than in the 2d mode of Nicholson or Austin's. I already stated that alternate block was 4 inches lower the next one to it.

34 int. You understand, do you not, what I mean by the words, "the method of forming cells?"

Ans. Yes; I understand what the word method means.

35 int. The question is confined particularly to the method of forming cells; it has no reference to their size or capacity. Please to answer whether there is, in your judgment, any essential difference

in the method by which the cells are formed, in the two instances referred to.

(Objection. Objected to, because it implies that the method of forming the cells does not include the capacity and size of the cell formed as a part of such method.)

Ans. There is a great difference between the methods of forming the cells in the two pavements. The cells in Nicolson's 1st method are formed by blocks of 8 inches high and 4 inches high; they
587 are put together alternately in one course, and in the next course are high block joints, adjoins the lower blocks, and thus the cells are formed. In such way, in the Nicholson's 2d method, the cells are formed by blocks running in a continuous line across the street, leaving a space of one inch open, and commencing with another continuous line of blocks parallel with the first; but before the 2d course will be put in to form the space a strip will be inserted one inch thick, 3 inches high, to keep the regular of the spaces; to make a straight line of the space.

36 int. The last question was confined to a comparison of the method of forming cells in Nicolson's 1st method and in Crannis & Kemp's method. You have answered it by comparing Nicholson's two methods. Be good enough to dismiss from your mind Nicholson's 2d method, and state whether there is any, and what, difference, in the method of forming the cells in Nicolson's 1st mode and Crannis & Kemp's mode.

(Objection. Objected to because it incorrectly assumes that the witness answer the former question only by a comparison of Nicolson's two methods.)

Ans. I explained Nicolson's 1st mode. I explained Nicolson's 2d mode. The cells in Crannis & Kemp's specification are
588 formed in the same way as the cells in Nicolson's 2d method, and in Austin's pavement, except that the cells do not form a continuous line across the street because the joints of the blocks are broken.

37 int. Please to compare the way in which the cells are made by Crannis & Kemp with the way in which they are made in Nicholson's 1st method, and say whether or not there is any difference in those two methods; and if so, whether or not it is an essential difference.

Ans. There is a difference, and it's an essential difference.

38 int. What is it?

Ans. The cells in Crannis & Kemps specification are filled up with strips only one inch lower than the blocks; they are only one inch wide. The cells in Nicolson's 1st method are 4 inches deep, and 4 inches square.

39 int. Do you understand that the Crannis & Kemp's specification is confined to any particular size or form of block? if so, what?

Ans. I saw in the drawing "fig. 15," sheet "A," that the blocks are oblong. The blocks are in parallelogramic form, and of two different sizes, in point of height and thickness; they are laid in such a manner that the high and low blocks alternate in each row.
589 The description of the blocks is not given to a certain size.

40 int. Suppose square blocks, like Nicolson's 1st method, were used in the Crannis & Kemp's pavement, would there then be any difference in the way in which the cells are produced in the two methods of Nicholson's 1st, and Crannis & Kemp's? and if so, what?

(Objection. Objected to because it is not competent for defendant's counsel to cross-examine his own witness, and the witness has already fully explained the method of construction of the 2d pavement enquired of, stated that an essential difference exists between them, and explained in what such essential difference consists.)

Ans. By using square blocks in Crannis & Kemp's pavement the cells would be square the same as in Nicolson's 1st method; but only one inch deep, instead of 4 inches, as in Nicolson's 1st method.

41 int. How would they compare in the method of making inch cells, if the short blocks in Crannis & Kemp's were 2 inches shorter than you have supposed them in your last answer?

Ans. The cells would be then 3 inches deep, instead of 4 inches, as in Nicolson's 1st method.

590 42 int. Do you understand that inch, 1 inch, would constitute any, and what, difference in the method of the production of the cells?

(Objection. Objected to for same reason as given to the 40 int.)

Ans. A difference of one inch would be of no great importance.

43 int. What was the proper business of your co. commissioners in the board of public works before they filled that office? and do they, or either, and which of them, continue to carry on their proper business now? Are they, or either, and which of them, civil engineers by profession? or are they, or either, and which of them, as expert and skillful in matters of this nature as you are, and as well able to furnish testimony respecting such matters?

Ans. Mr. Litz was in the iron business; manufacturing of iron for building purposes. I don't know what's the business of Mr. Rose. I once bought a pair of boots at his store. Mr. Letz is a good mechanic, and still continues to carry on his business. They are neither of them civil engineers by profession; it is too delicate for me to answer whether they are as expert, or whether they can give as clear information as I can.

591 *Cross-examination.*

1 x. You have read on this examination the specifications by Mr. Nicolson of his first and 2d mode of constructing his pavement, as described by him in his reissued letters patent. Please state whether you consider those two modes essentially the same in principle, or are they different? If you should say they are different in principle, please state in what respects they differ in principle, in your opinion.

Ans. They are so far different in principle that the spaces in the first mode are formed by inserting lower square blocks than the next blocks to it, and that the same spaces touch each other on their corners in a diagonal line. The spaces in the 2d mode of Nicholson's

pavement are formed by oblong blocks running across the street in a continuous line, with one inch joints between each row of blocks. (The question is repeated to the witness and he is requested to answer it.) They are different. By inserting the blocks of the 1st method, you put the high block and the low block, then another high block and a low block, together, and continue on so across the street, forming in the row of these blocks the cells in the 2d method; the
592 blocks inserted in one row are all of the same height; therefore no cells can be formed in one row of the blocks, as is the case in the 1st method of Nicholson pavement. To form the space in the 2d method, after one row of blocks has been set in, as has been mentioned, strips 3 inches high and one inch thick will be inserted, and the next row of blocks put in, thus forming the space in a straight line 1 inch wide and three inches high. I consider this a difference in the principle in forming cells in those two methods.

2 x. Suppose a pavement constructed in the first mode of Nicolson as described by him in his specification to the reissued letters patent, please state whether, in your opinion, the short blocks forming the cells would require to be nailed to the other blocks or to the flooring, in order to prevent them from working up when filled with the tar and gravel concrete, firmly rammed into the cells as directed by said specifications?

Ans. I do not think it would be absolutely necessary to nail those 4-inch square blocks to the floor, or to the adjoining block, when the same fill out the space fully, so that no gravel can run through the joints under the bottom of the block.

3 x. Look at the printed copy of the specifications for laying
593 the wooden pavement on Wabash ave., now handed to you and marked plaintiff's exhibit, to this your deposition, marked "A," and state whether the portion of the same numbered "3," and headed "paving," is a correct statement in substance of the method of paving contracted or ordered by the def't to be laid down on Wabash ave., in this city; if you state also what length of said paving has been ordered, and when the same begins, and where terminates, and about the No. of square yards embraced in the same?

Ans. The printed specification shown to me has been copied from our office, and I think the same is in all respects correct, although I have not the original specification on hand to compare it with the one printed. The portion No. "3," headed "paving," is correct in substance; the pavement commences on the south line of Randolph st. and runs down to the north line of 22d st., a distance of about 11,300 feet, more or less; I can't state the exact number of feet, containing about 63,000 square yards, more or less.

4 x. State the different streets or parts of streets or alleys in Chicago, which are now being laid, or ordered to be laid, with a similar wooden pavement to that described in said specifications for the paving of Wabash avenue, giving the commencement and termination of each peace of pavement, and the No. of square yds. in the same, as nearly as you can?

594 (Objection. Objected to on the ground that it is improper

on cross-examination, and if competent at all, should have been given in the comp's direct testimony, and also calls for the contents of written orders and contracts.)

Ans. In strip accordance with specifications for the paving of Wabash ave., the following streets have been paved heretofore; W. Lake st., from Lake st. bridge to Halsted st.; S. Wells st., from Madison to Van Buren st. Those are the only streets built or paved according to the specification for Wabash ave., ordered to be laid in exactly the same manner as the following streets: Part of S. Wells, from Van Buren to Taylor st.; Van Buren st., from the bridge to Michigan ave.; La Salle st., from Washington to Madison; S. Water st., from Clark to Franklin; S. Water, from Wabash ave. to Michigan; N. Clark st., from the bridge to Chicago ave.; Walcott st., from Kinzie to Michigan; Michigan st., from Cass to Clark; W. Randolph st., from the bridge to Halsteds st.; Dearborn st., between Monroe and Madison sts.

5 x. State for which of the pieces you have mentioned contracts have been entered into for construction, and which of the same are finished or in the course of actual construction.

Ans. On W. Lake st., from Lake st. bridge to Halsted st., it is finished; also S. Wells st., from Madison to Van Buren; S. Dearborn st., from Monroe to Madison st., is almost finished. Wal-
595 cott st. and Michigan st. are contracted for. Wabash ave. is contracted for, and in the course of paving.

6 x. With the exception of the little piece or specimen of the so-called Austin paving you have mentioned, state whether, since laying the pavements on East Lake st., any streets or parts of streets in Chicago have been laid, or contracted to be laid, with any wooden pavement of a different description from that described in the said specifications for Wabash ave., marked Ex. "A;" and if yes, what streets, and describe the difference.

Ans. There have been laid, heretofore, several other streets with wooden pavements of a different description, as the one for Wabash ave.; the following are the streets:

(Counsel modifies the last question so as to read "since laying the pavement on East Lake st.," after the word "whether.")

Since the pavement of East Lake st., which pavement has been built or laid in a different description from the former, up to the time of the paving W. Lake st., only two streets; intersections have been paved by my recollection, and as this was the time when the board of public works considered to make a change in some parts of the paving of Nicolson's, and in some parts of making the wooden
596 pavement, I am not certain if those two intersections mentioned received the change; it can be found by breaking up a part of it, and I can state we made a change; those intersections are on Randolph and Clark sts., and Clark and Madison; the difference in the change of the paving between East Lake st. and West Lake st. lays in the form in which the wooden pickets have been connected with the balance of the pavement, the first pavement referred to East Lake from experience. In East Lake st. the strips have been

put in loose, and from experience we find it necessary to nail these pickets to the blocks to prevent their working up. In W. Lake st. they were accordingly so laid; all the difference in any of the wooden pavements from Wabash ave. consists in the nailing of this strip.

7 x. By your expression, "put in loose," in the foregoing answer, do you mean that it was put in as required by the Wabash specification; that it was not nailed a little by 2 ten penny nails as therein required?

Ans. Yes.

8 x. State whether the board of public works, in advertizeing for proposals for the said pavement to be constructed on S. Wells, from Madison to Van Buren, did or not also advertize for proposals
597 for a similar paving to that described in such specifications for the Wabash ave., with the omission of the strips between the blocks.

Ans. Yes; we have made such an advertisement.

9 x. Look upon the writing now shown you, marked "plff. Ex. B," and state whether the same is a correct list or statement of the names of the persons who presented bids to said board for said work, and of the respective amounts bid by them for the said work according to each of the said methods.

Ans. I think it is a correct list, although I have not the original bids before me to compare it with; the name "Markin" ought to be spelled Mackin.

10 x. Please state by which of the said parties named in the said list the work was performed, and whether the same is now completed.

Ans. The contract was awarded to Stewart and Steele, and is now completed.

11 x. At what price was the same awarded to the said Stewart and Steele?

Ans. I believe at the sum of $20,490, as stated in the
598 exhibit.

12 x. State whether you are acquainted with Sam'l S. Greeley, and whether the said Greeley was one of the parties who made a bid for said paving.

Ans. I am acquainted with Sam'l S. Greeley, and he was one of the parties who bid on the work.

13 x. State whether the said Greeley called upon you or at your office prior to the time allowed for filling such bids, and made inquiry as to manner in which the difficulty of keeping the blocks in proper position for filling, and of preventing their displacement, &c., without the strips or short blocks, was to be overcome; and whether you did not, in response to such inquiries, state to him state one way which was proposed to avoid the difficulty was to use the strips until a sufficient No. of rows of blocks were laid to go on with the filling, and then remove said strips from the spaces by means of a fork or some other suitable tool for that purpose.

(Objection. Defendant objects to the question as leading and instructing the witness, and that the conversation referred to between said Greeley, and the witness would be incompetent in this case.)

599 Ans. Greeley came to my office about two days before the time of opening the bids for the paving the said Well st., and he did make such inquiry, as stated in the question; that was the language that I gave it.

14 x. Did you or not, in reply to a statement of said Greeley in the same conversation, pointing out the practical difficulties of using the strips in the manner proposed and the liability to displace the blocks from a right position in removing the strips, make use of the following language or words to that effect, "Well, we cannot help it; we are bound to get rid of the strips anyhow; they are all the trouble."

(Objection. Objected to on the ground that the conversation inquired for is incompetent, and if it were advisable, the only fair and correct way of getting it would be to make the witness state what the conversation was without suggesting from the question.)

Ans. I never had the same apprehension of the great difficulty. (Objection. Pl'ff's counsel objects to witness further answering in respect to his opinion as to the difficulty referred to, and asks to have the question re-read to the witness by the com., the witness requested to give a direct answer to the same.) I think I used
600 those words, but I am not quite certain if they are verbally correct; the substance of it is correct.

Re-direct.

44 re-d. Suppose a pavement constructed on Nicolson's first method, but, with tar paper instead of a wooden or solid foundation and support, what would be the effect on the short blocks and the filling, if that filling was firmly rammed into the cells as directed in the specification, if such blocks were not nailed to large blocks?

Ans. The foundation of tar paper would not be as good as wooden boards; the tar paper is elastic and would sooner decay than a wooden foundation; therefore I believe that the shorter and the filling or both might sink somewhat, what would not be the case so quick by a board foundation.

45 re-d. What would be the effect on the small blocks, of the ramming, when the foundation was only tar paper?

Ans. Tar paper does not give so much resistance as wooden boards; therefore the ramming may make on the tar paper some impression, and make the same unequal in its surface on the bottom where the long blocks rest too.

601 46 re-d. Would the square blocks in Nicolson's 1st method be subject to shrink, and if so, what would be the effect if they were not nailed or fastened?

Ans. Wooden blocks are always subject to shrink, but in a pavement on the street there is always more or less moisture from below to prevent too much of shrinking.

47 re-d. Do you approve of Nicolson's 1st method; if so, why it is not laid more in Chicago; if you do not approve of it, what are your objections?

(Objection. Objected to as a further examination of the witness in the matters in respect to which he is fully inquired of in the direct

examination, in regard to which no questions were asked him on the cross-examination.)

Ans. I do not approve of Nicolson's 1st method. My objections of not approving the same is that the cells represent the surface just as large as the higher blocks, giving too much space for the filling to be worked out or worn out by the horse, thus creating after a very short time a very uneven surface, as could be seen at the intersection of Clark and Washington streets.

602 48 re-int. Were the several pavements and contracts, referred to in your answer to the 4th and 5th cross-ints., respectively constructed or contracted for before or after you had taken up and examined a specimen of the Austin pavement at the intersection of Clark and Randolph?

Ans. They had been partly contracted and finished, and some of them under contract.

49 re-d. In your comparison of the Austin's method of toe-nailed blocks with Nicolson's 2d method with nailed strips, I understand you to say, when completed, the Austin makes as good a pavement as the Nicolson; and am I right in this conclusion?

(Objection. Objected to for same reason as 4 redirecet-int.; also, because the same is leading, and incorrectly refers to statement, as having been made by the witness in his previous answer, and instructs him as to the mode in which the counsel desires the question to be answered.)

Ans. It makes just as a good pavement, the Austin as the Nicolson with nailed strips, and I should say if the workmen are accustomed to working in those blocks, the accustomed way, I should prefer the Austin pavement before the Nicolson, even with nailed strips.

603 50 re-d. If the Austin pavement, when completed, makes as good a pavement as Nicolson's 2d method, can you explain, and if so, please do so, why Well st. paving was let at upwards of $20,000, when the same contractor offered in his bid to construct the pavement then without strips for $17,500?

Ans. Mr. Greeley came to my office about 3 days before the bids had been opened for the Wells st. pavement; he told me that the board ought to decide before opening the bids what method of paving should be applied, because after opening the bids a confusion might arise. In the single bids, we asked for 3 or I believe 4 different bids; we first asked bids for Nicolson's 2d method, then for Nicolson's 2d method without strips, and the 3d method like the Nicolson, the city furnishing tar in the joints and on top. Apprehending such a confusion, we decided that this job on Wells st. should be made in the same method as W. Lake st.; but nevertheless different bids, as advertised, came in, but we did not regard them, except the bids for the 2d method of Nicolson's paving.

51 re-d. Did Mr. Greeley take any and what part in inducing or persuading the commissioners to select the Nicolson method at that time?

(Objection. Objected to as calling for irrelevant and incompetent testimony.)

Ans. He did not persuade me.

52 re-d. Was this conversation before or after, at that time,
604 when Mr. Greeley put in his bid?

Ans. It was a day or two before he put in his bid.

53 red. Did you agree with Mr. Greeley in his observation, at the time he made them, or did you inform him of the determination of the com'rs before, or at the time, when he made his bid; if so, when?

Ans. To my best recollection, he came in our office to know of the decision of the board about the method of paving, and I told him the board had decided to apply the 2d method of Nicolson's pavement with nailed strips. It was before the time he made his bid.

54 re-d. Was not the conversation, in which Mr. Greeley advised that the board ought to determine beforehand which method of paving they could adopt, a part of the same conversation, or did it not take place on the occasion of the conversation to which you have referred in your answers to the 13th and 14th cross-int's?

Ans. Yes; it was at one and the same time.

55 re-d. Have any, and if so what, streets or part of streets in Chicago been laid with any wooden pavements, different from
605 the method, having nailed strips, except the specimen in the intersection of Randolph and Clark.

Ans. Yes; there are several other streets in the city paved according to Nicolson's 2d method, but without nailed strips. The streets are as follows: S. Wells st., from Lake to S. Water; Lake st., from Central ave. to Lake st. bridge; Central ave. itself; S. Clark st., from Lake to Polk; and Washington st., from La Salle to Clark, and a small portion of our bridge approaches, but I cannot tell if the strips are nailed or not.

Re-cross-examination.

Re-x. 15. At what time were the bids on said Wells st. paving opened?

Ans. About May 29th, 1865.

OCT. 4.

Re-x. 16. State what pieces of wooden block paving have been contracted to be laid down for the city since the 29th of May, A. D. 1865.

Ans. It was the pavement of Wabash ave., and the pavement for part of Wolcott and Michigan streets, and Dearborn st.

Re-x. 17. When were you first made acquainted with the specification or mode of construction of the so-called Austin pavement, and who first called them to your notice?

606 Ans. I made the acquaintance of the specification of the Austin pavement about 6 or 8 months ago to my best recollection, and our city att'y, Mr. Adams, showed me several printed documents, in one of which the specification of the Austin pavement was contained; Mr. De Golyer, as I stated in another question, paved a small part of the intersection of Clark and Randolph sts. in another

manner as Nicolson's 2d method, leaving out these strips, nailing the blocks, and called that Austin pavement. This was in May, 1863.

Re-x. 18. Were you not aware of a suit against the city by Nicolson for a violation of the original letters patent, which was pending in 1863?

Ans. I was aware of such a suit, but I believed, as far as I know, the suit was at that time against Mr. De Golyer; hereafter I heard from the city att'y, Mr. Adams, that the suit had been commenced against the city.

Re-x. 19. Is there any provision, and if so, what is it in the Austin method or combination for tarred paper or any similar substance to be used in combination with the board or other foundation on which the paving blocks are to be placed to prevent the absorption of moisture from below?

Ans. I have to see the specification to answer that question fully. (The specification is here handed to the witness who says:) Be-
607 sides the wooden foundation or a foundation of slate or iron, I cannot find any other provision for a foundation of the Austin pavement. (The com'r is requested to repeat the question, and ask for an answer responsive to the question.) I do not understand the question fully in regard to preventing the absorption of moisture from below. I have already stated that no other foundation is given in the Austin but wood, iron, slate, &c.; there is no provision for tarred paper.

Re-x. 20. Is there any provision in said Austin's specification for tar, hydraulic cement, or other similar substances acting as a preventive of moisture to be used in combination with the support or foundation on which the pavement is to rest? if yes, state what it is, and point out the portion of the specification by which it is provided.

Ans. Yes; there is a provision in the specification, and the same is embraced in the following words, on page 2, folio: "These intervals or spaces may be of the width of one inch and a half or thereabouts, and are to be filled in with broken stone, refuse or broken slate, grit, gravel, sand, or any hard or any fibrous substance, this filling in being cemented or concreted together with liquid lime or cement poured in with pitch or lac, and caoutchouc dissolved in naptha melted, poured in or with any other adhesive liquid material."

608 Re-x. 21. Are the substances you have named as referred to in the clause referred to, specified as having any other connection with or effect upon the board foundation beneath them, except to rest upon or be supported by the same?

Ans. I have to read the whole of that part of the specification referred to in my last answer. Those substances referred to are not put into the spaces for simply resting on the foundation. The pavement thus formed will present a constant, secure footing.

(Objection. Objected by pl'ff to this part of the answer, as not responsive to the question, and com'r requested to read the ques. before witness proceeds further.)

Ans. The specification does not say what effect those substances will have on the foundation.

Re-x. 22. Do you understand that the office, purpose, or effect of the composition filling referred to is in any degree to prevent the absorption of moisture from the ground beneath the foundation? if so, please to advise us how they operated to fulfill that office.

Ans. Those substances in itself and in connection with the blocks will prevent the absorption of moisture from below; any mate-
609 rial which is to be prevented or protected against absorption of moisture is generally covered with such substances as a preventive.

Re-x. 23. Do you mean to be understood that the effect of the composition filling resting on the top surface of the inch flooring would be felt on the under surface of such flooring resting on the ground and prevent such under surface from absorbing moisture from the ground beneath.

Ans. The pouring in of the liquid substances will cover the top of the flooring, but I do not think it will penetrate through the floor of the foundation, if it's of wood. It would not prevent the absorption of moisture from below into the bottom of the boards.

610 *Re-direct examination.*

56 re-d. When did you first hear of any suit by Nicolson against the city from Mr. Adams? Was he then city att'y, and when did he enter that office?

Ans. I first heard of a suit of Mr. Nicolson against De Golyer or Greeley as his agent.

57 re-d. The question has no reference to Mr. Greeley, and is confined to the city. When did you first hear that the city was sued by Nicolson, and from whom?

Ans. To the best of my recollection I heard about a year ago of a suit of Mr. Nicolson against the city, and I believe I heard this first by Mr. Adams at that time, or I may have heard it from another city official.

58 re-d. How would a foundation of board, stone, slate, or iron, as referred to, by Austin with the tar or other adhesive liquid soaking through the concrete, as you intimated in your cross-examination, compare as a durable preventive of moisture from the ground below with a foundation of tar-paper merely, without any wooden foundation; that is, would such Austin method be a better or worse, or as good, preventive to moisture from below.

611 Ans. I have never said that it would soak through the concrete; it is an impossibility.

59 re-d. How would a foundation of wood, stone, slate, or iron, as mentioned by Austin with the tar or other adhesive liquid in connection with the blocks, and covering the top of the flooring, as stated in your answer to the 23d cross-int., compare as a durable preventive to the absorption of moisture from below with a foundation of tar-paper merely, without any wooden foundation? which would be the best and most durable preventive?

Ans. The foundation of stone, wood, slate, or iron, as mentioned

n the Austin specification, would be a far better preventive against the absorption of moisture into the pavement from below than tar-paper would be.

J. G. GINDELE.

612 *J. G. Gindele.—Ex. A.—P. A. Hoyne, U. S. Comm'r.*

Specifications for curbing with curb-stone, filling and paving with wooden block pavement, Wabash avenue, from the south line of Randolph street to the North line of Twenty-second street.

I.—Curbing with curb-stone.

The curb-stone to be set in Wabash avenue to consist of the most suitable limestone of Athens stone quaries, free from cracks, seams, or sand mixture, not less than five (5) feet long, three feet and six inches (3 ft. 6 in.) deep, and five inches thick when dressed, with the edges full and square, and having close joints their full depth. Each curb-stone to have a square base its entire length—and to be neatly—bosh hammered for a distance of 12 inches from the top surface down; catch-basin stones to be built thus:

[Here follows drawing, marked page 612.]

613 in a similar manner as that at the northeast return of Fourteenth street and Wabash avenue.

Where necessary, and required by the board of public works, said curb-stone shall have a back fitting, compactly rammed down, sloping from a point eight inches below the top of said curb-stone, at the rate of two to one, (2 to 1,) thus:

[Here follows drawing, marked page 613.]

Curb-stones in said Wabash avenue now below grade shall be raised to grade and reset, and bad and unfitting ones replaced by new ones of the aforesaid description.

Property holders are allowed to raise the curb-stone to grade and replace bad and unfitting ones by new ones of the aforesaid description; and also build the curbing in front of their own lots—each man in front of his own property. The work to be done under the direction of the board of public works, and according to the foregoing specifications.

Property holders availing themselves of this permission to build their own curbing, will be required to commence work on the same ten days in advance of the time that the contractor is prepared to build the same, and to have the same finished complete ten days

614 in advance of the grading, or else the curb-stones will be raised or set, as the case may be, by the city, under the contract to which these specifications pertain.

II.—Filling and Grading.

The earth filling in said Wabash avenue shall be smoothly graded and shaped to conform to the shape of the pavement, so that the ballasting, gravel or sand, on which the wooden pavement shall rest will be of a uniform thickness, and shall be well puddled, rammed, or

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rolled, whenever the board of public works shall direct, and shall be so firm and compact as to be secure from settling. Any surplus filling now on said Wabash avenue shall be removed by the contractor to such places in said avenue and its approaches to other streets intersecting the same, as are not high enough filled, and wherever filling is need, the same has to be furnished by the contractor.

Approaches.—Approaches connecting said Wabash avenue with the streets and alleys intersecting the same, and such portion of Wabash avenue as lies north of the south side of Randolph street, and south of the north side of Twenty-second street, will be filled by the contractor, so that the same shall have a slope not greater than one foot in twenty, unless the board of public works may otherwise direct.

615 The surplus macadam now being at the intersection of Twelfth street and Wabash avenue shall be taken up by the contractor and used for the approaches of said Twelfth street to Wabash avenue.

A portion of the boulder stones at the intersection of Randolph street and Wabash avenue to be taken up by the contractor and repaved to connect with the new pavement. Also the gravel at the intersection of Madison street and Wabash avedue.

III.—Paving.

The pavement, known as the wooden block pavement, shall consist of—

First. A bed of ballasting sand, six inches in thickness, laid upon the top of the filling, and smoothly rounded to the shape of the street, as per sections on file in the office of the board of public works, in the book of street improvement pages. The ballast sand to be clean, uniform in character, containing no pebbles of a larger diameter than one inch.

Secondly. A flooring of sound common five inch boards, running in courses lengthwise of the street, thoroughly swabbed on both sides with pot-boiled raw coal tar, mixed half and half with a composition of tar, boiled down to the proper consistency to make a thorough coating, the ends resting upon stringers of the same material, placed transversly; the whole evenly laid to such crown and grade as

616 is shown on the aforesaid sections, making a part of these specifications.

Thirdly. Rows of sound three-inch Norway or white pine blocks, free from sap, loose or rotten knots, or other defects, six (6) inches long, placed on end upon the flooring, the rows running across the street, an inch apart.

The blocks in the different rows of the pavement to break joints in a similar manner as in brick masonry; said blocks will be sawed from three-inch planks or joists. It is expressly understood that the board of public works reserves the right to examine the lumber in the street before sawed into blocks, also the blocks, and to refuse any and all blocks and lumber brought in the street for the

above purpose, especially if the appearance of the same shows that they had been cut of "dead logs;" that is to say, logs that have been exposed to the weather for such a length of time, before having been sawed, as to take their vital strength from the same.

Said blocks shall be set up, as aforesaid, endwise upon the flooring in rows running across the street, being separated by strips of boards or pickets. Said pickets shall be not more than one inch thick nor more than three (3) wide, not more than four feet long, placed on edge between the rows. Every picket or strip shall be nailed to the bottom of the blocks by two 10-penny nails, to prevent
617 their working up; the blocks to be fitted so as to make close joints, and shall be uniformly laid, not varying in thickness more than a quarter of an inch in the same row; all rot and defects to be trimmed off, and the rows, both of blocks and strips, to be laid closely together.

The spaces or joints between the rows of blocks and above the strips shall be filled with clean roofing gravel and a composition of tar, equal to the best prepared by Messrs. Arnold, Barrett & Powell, for such purposes, thoroughly mixed and compactly rammed down by means of a paver's rammer and an iron blade prepared to fit the joints, which is only to be moved three-fourths of its length at a time while ramming, so that all parts of the same shall be thoroughly rammed.

The gravel shall be applied thoroughly dried, and heated enough not to chill the tar, and shall be composed of small pebbles of size from that of peas to that of walnuts, and free from fine particles or sand, which may prevent the tar from penetrating. All the tar used will be so boiled down and thickened that, when cool, it shall be tough and fibrous, without liability to become brittle in cold weather, and shall be equal in quality to that used in the block pavement of Wells street at the intersection with Madison street.

618 It is hereby expressly understood that there shall be no raw coal tar used in filling the spaces or joints between the blocks, in said improvement of Wabash avenue, but the clean composition above named. Said composition to be applied hot, and in such quantities as to fill and penetrate the joints, using for that purpose two gallons of composition to every square yard of pavement.

Before any tar is applied to the above pavement, a sample of the same must be brought to the board of public works by the contractor for examination, under penalty of forfeiture of his contract.

The whole surface shall be thoroughly sprinkled with a mixture of the aforesaid composition and coal tar, heated, and immediately covered with roofing gravel, and common sand or gravel, mixed in about equal portions, and not less than three-quarters of an inch thick.

It is expressly understood that the swabbing of the boards under the blocks and the top sprinkling of the pavement is not included in the above enumerated amount of tar.

The aforesaid mixture of composition and coal tar, for the swabbing and sprinkling, shall consist of one-half of each kind.

619 Grade.—The top of the wooden blocks in the corner of the curb-stones, (at the catch basin,) at the intersection of Wabash avenne and other streets, to be eighteen (18) inches below grade of the sidewalk, and crown an arch from the gutter to the centre of said Wabash avenue twelve (12) inches; thence rising to a point of intersection of the centre of said Wabash avenue with other streets four (4) inches, so that the centre of said intersection shall be four inches than the other four centres at the street lines.

The gutter shall rise from the corners of the aforesaid curbs (centres) towards the centres of the blocks, at the rate of six inches in one hundred feet, to a summit as usual, and as shown on the aforesaid drawings.

Cross-walks.—There shall be cross-walks at all street intersections or crossings, to be made by raising the wooden block paving in the same manner as usual, (three inches rise in the centre of the walk.) Said cross-walks will be made eleven (11) feet wide, corresponding with the paving of the street, and three (3) inches higher; and, unless otherwise directed by the board of public works, there will be four (4) such cross-walks constructed at each street intersection.

620 All labor and material connecting the new pavement with the stone pavement with Wabash avenue, at Randolph street, or with the gravelling of Madison street, or with the macadam in Twelfth street, etc., or with the openings for sewerage, gas, or water purposes, (such sewerage and water structures to be brought by the city to grade and gas structures by the gas company,) and in general everything necessary to fully complete the work, so that with the completion of the paving, the street shall be in complete order, ready for use, shall be furnished and done by the contractor. Anything herein omitted and shown on the aforesaid drawings, and vice versa, shall be done by the contractor without extra charge or cost to the city of Chicago.

Contractors will bid so much for filling, grading, and paving of the whole work; 2. So much for the running foot of curbing and back filling; and 3. So much for the running foot of raising the present curb to grade where needed.

621 *Bids received May 29, 1865, by the Board of Public Works, for laying the wooden block pavement in South Wells street, from the north line of Madison street to the south line of Van Buren street.*

Contractors.	First method like the Nicholson pavement.	Second method without strips between the rows of blocks.	Third method like the Nicholson pavement, the city to furnish and apply the tar in the joints and on top.	Area walls.
John McBean	20,700 00	22,000 00	17,000 00	15-20
H. Nash	23,956 00	25 cents per yard additional.	25 cents less than first.	20-00
J. McMahon	21,675 00	21,675 00	30 cents less.	12-00
Markin	24,058 50	25,878 00	21,618 00	------
Gladding, Donohue & Co.	23,000 00	23,000 00	20,000 00	------
Stewart & Steel	20,490 00	17,500 00	17,500 00	16-50
S. S. Greely	31,460 00	33,000 00	29,200 00	18-50
Masterman & Loberg	30,794 00	33,595 00	----------	18-00
W. Griffiths	28,350 00	29,850 00	26,000 00	17-00
J. E. Quinn	23,000 00	23,000 00	19,400 00	------

Pl'ff's Ex. B.

P. A. HOYNE, *U. S. Com'r.*
J. G. GINDELE.

622 Endorsed: May 29th, 1865. Bids received by the board of public works for laying wooden block pave'n't in Wells street. Gindele's exhibits.

623 *Deposition of D. L. DeGolyer.*

David L. DeGolyer, being duly sworn, says:

1st. What is your name, age, place of residence, and occupation?

Ans. Name, David L. DeGolyer; age, 56 years; resides in Chicago; occupation, paving contractor for paving streets.

2nd. State how long you have been road-making and paving, and in what places, and how long in each place.

Ans. Seven years in Cincinnati, and at the same time I was paving at Toledo and Louisville, and the balance of the time here—making 16 years in all.

3rd. State whether you have had any contract for the construction of wooden pavements on streets in the city of Chicago; if so, when, and what streets. Also, state whether you have constructed wooden pavements elsewhere; if so, when.

Ans. I had a contract in Chicago for the paving of Lake st., from the east line of Wabash ave. to Lake st. bridge, in 1861; also, a contract for paving Lake st., from Central or to Wabash ave.; and also,

in 1862, for the paving of South Water st., from Franklin to Lake st.; also, in 1863, a contract for paving West Lake st., from the west line of Halsted to the R. R. bridge; also, the intersection of Clark and Randolph sts. In the spring of 1863 I contracted all of
624 the pavements before mentioned. I am, at this time, constructing wooden pavements at Toledo.

4th. State whether you have examined the amended specifications annexed to the complainant's reissued letters patent; and if so, state whether you understand the manner in which the 2nd plan, described in the said specifications, of practising the complainant's alledged invention is put into practice.

Ans. I have examined the annexed specifications, and understand the practical mode of laying it; in other words, I can put it into practice.

5th. Have you examined the specification of Henry Austin, marked No. "9,737," defendant's "Exhibit 'G,'" showing how a pavement may be constructed of blocks, square or oblong, the ends laid together without intervals or spaces between the ends, but forming parallel lines and intervals in the length only, and filled in?

Ans. I have.

6th. State what the difference is, if any, between the Austin pavement and Nicholson's 2nd plan, as described in the amended specification, and illustrated by diagram No. "2," in defendant's Exhibit "A."

625 Ans. The difference between the two plans, if they may be so called, the flooring is the same between the two, either boards or planks; the blocks are laid in the same manner, transversely across the street. Austin's blocks are nailed or glued fast to the foundation floor. Nicholson, from his amended specifications, used a strip or picket between blocks, and it forms a cell or space between the blocks. In Austin's specification there is no strip used between the blocks to form a cell. The cell in Austin's pavement extends to the foundation of the board or plank from the surface of the block. The Nicolson pavement, in the manner we have laid it here, the cells extend down one-half the length of the blocks, the pickets being one-half the depth of the blocks and one inch in width.

7th. Are there any other differences between the two pavements, Austin's and Nicolson's?

Ans. I don't know of any other material differences.

8th. State whether, in your opinion, the use of these strips of boards, in Nicholson's 2nd method, in the spaces between the parallel rows of blocks, increases the utility of the pavement.

Ans. I think it does not.

9th. State the reasons of your opinion.

626 Ans. My reasons are these: The cell or space between the block, being filled from the foundation to the surface of the block with stone, gravel, and concrete, will last longer than the same filling being but half-way to the foundation. When the wear and tear of travel comes on the pavement, the concrete or gravel takes a certain portion of wear and tear from [from] the block, and when it

wears down to the strip which Mr. Nicholson describes, the pavement becomes entirely wood—the strips and blocks is all it consists of; consequently, the last half of the blocks will wear out much sooner than if the gravel and concrete extended to the foundation.

10th. Suppose a pavement, constructed according to Mr. Nicholson's 2nd method, to be worn down to the surface of the strips, will it be more or less slippery than a pavement in which the interstices are filled with broken stone or gravel and tar?

Ans. It would be much more slippery.

11th. Have you formed any estimate of the relative cost of the Austin pavement, in which no strips of boards are used between the blocks, and Nicholson's 2nd method of constructing his pavement? If so, state the result of such estimate.

Ans. I have. I think I would rather lay the Austin pavement down than the Nicolson 2nd method.

627 (Objection. Objected to the last part of the last answer.)

12th. Is the cost of filling the whole intervals or spaces between the parallel rows of blocks with gravel or broken stone and pitch or tar, less or more than filling half of such intervals with strips of boards, and the remainder with gravel or broken stone and pitch or tar?

Ans. The cost is less, according to my estimate and practice, filling the whole with stone or gravel and pitch or tar

13. State if the strips of boards used in Nicolson's 2nd method were or were not fastened to the foundations or flooring in pavements constructed by the defendant; if fastened, how, and why.

Ans. The pavements we first laid, the strip was not fastened except slightly every fourth or sixth row. Under the last contracts I made, we were required to put in 2 tenpenny nails every 4 feet; the reason we done this was, if they were not nailed to the foundation, the strips would work up and throw out the gravel and concrete, so there would be no gravel left. The pickets were 4 feet long; we put two nails in each picket, one at each end.

14. Have you laid any of the pavement described by Henry
628 Austin in his specification? If so, how did you fasten the blocks to the flooring?

Ans. I have. I fastened the blocks to the flooring by toe-nailing each block by one nail.

15. State, if you know, how the cost of toe-nailing the blocks in the Austin pavement compares with nailing the strips of boards in the Nicolson pavement.

Ans. The cost is very little difference; you can hardly tell the difference. To explain: The pavement, in going across from curb to curb, we formed 2 gutters, one on each side of the street. In forming these gutters, the strips or pickets have to be cut in two; consequently, we put in 2 more nails in such pickets than in any others. It takes just double the nails to nail them. It would take less time to toe-nail the blocks than it would to nail the pickets. The picket, having to be cut in two, in order to form the crown of the streets and the gutters, the cost of the material and labor would be in favor of the Austin pavement, in my opinion.

16th. State whether, in your opinion, derived from your practical experience, the use of the strips of boards, instead of the concrete filling between the parallel rows of blocks, increases or otherwise the convenience of construction.

629 Ans. I would lay one down just as cheap as the other, same price; I think it does not increase the convenience of construction.

17th. State whether, in your opinion, there is a difference in principle, or in construction, between the Austin pavement and Nicolson's 2d method of practising his alleged invention.

Ans. There is no difference in the principle, as I understand it. There is a difference in construction as far as laying the strips are concerned, but there is no difference in laying the blocks.

18th. Could a man of ordinary skill, in constructing wooden pavements, construct the Austin pavement from Austin's specification alone?

Ans. Yes, sir.

19th. State how long a time it would require for a practiced workman, skilled in constructing wooden pavements, to form a reliable opinion as to the durability and utility of a pavement constructed in accordance with Nicholson's 2d method, the same being constantly exposed to public travel during the time of observation.

Ans. On a street, Lake st., I think, a skilled man could tell in 18 months or 2 years, by close observation.

630 20th. State whether you have ever made any actual comparison between a pavement constructed in accordance with Nicolson's 2d method (with the exception of the nailing of the strips) and a pavement constructed in accordance with Austin's specification. If so, when, where, and for what purpose, and what was the result of such comparison.

Ans. I have made the comparison. I laid at the intersection of Randolph & Clark st., in this city, about 1-10 of the intersection according to Austin's plan, the balance of the intersection was laid according to Nicholson's 2d method. I laid this in May, 1863. In the latter part of July, 1865, (July 31, I think,) the board of public works, together with the superintendent, had some of each pavement taken up in my presence. Of the Austin, I examined 5 blocks; 2 blocks were taken out, 3 that remained in the street. We found on taking them out they were perfectly sound, and solid as a compact mass, to the foundation or flooring; there was no sand or gravel under the blocks or between the blocks and the foundation. The Austin blocks were taken up on Randolph street, 7 or 8 feet from the corner. The other blocks that was laid down with strips were taken up at an equal distant from the corner, on Clark street. They were not so firm as those laid after Austin's plan. As I understood it, the purpose was to take the testimony in this trial, or to see which was best.

631 21st. State, if you recollect, the superficial dimensions & locality of the section of the Austin pavement, constructed as aforesaid.

Ans. The location is between the horse R. R. track on Randolph

st., the north curb line on Randolph st., adjoining the Sherman House, about 16 ft. by 26 or 28; it's what is termed the west wing; the long way of the section is transverse with Randolph st.

22d. State whether or not this section of the Austin pavement lies contiguous to a wooden pavement constructed in accordance with Nicolson's 2d method; and if so, state whether you made a comparison between the appearance of the surface and the wear of the blocks of the 2 pavements, and what was the result of such comparison.

Ans. It lies contiguous to a wooden block pavement according to Nicolson's 2d method. The difference between the surface is but very little, the Austin being somewhat smoother than the Nicolson. I could not discern any material difference in the wear of the blocks. It would take time to ascertain that fact.

23. Did you notice any difference between the 2 pavements as to the compactness and solidity? If so, what?

Ans. I did. The Austin pavement is more solid and firm,
632 or compact than Nicolson's.

24th. Are you acquainted with the materials used, and the methods of constructing the several wooden pavements of David Stead, Exhibit marked "B," Henry Austin, Exhibit marked "G," and Nicholson's 2d method?

Ans. I am.

25th. Do you know, and if so, state whether or not Stead's method consists of wooden blocks; and if it does, explain whether they are cut transversely or otherwise, and how. State also how they are placed with reference to the fibre of the wood, and also with reference to their proximity or nearness to each other.

Ans. Stead's method consists of wooden blocks cut transversely across the wood. The blocks, as I understand his plan, is set on the ends, so the fiber of the wood is exposed to the travel. They are set close together.

26th. In addition to the prepared foundation of plank or boards, state what is the difference, if any, between Austin's and Stead's method.

Ans. Leaving the foundation out of the question, the difference consists of the formation of cells or spaces by Austin, filled with gravel and sand. The space is formed by placing the block
633 from 1 to 2 inches apart—the space goes the entire length of the block.

27th. Do you know, and if so, state whether or not Austin's method consists of wooden blocks; if it does, state whether they cut transversely, or how. State also how the blocks are placed in reference to the fiber of the wood, and also in reference to their nearness or proximity to each other.

Ans. It does. They are cut transversely. We lay the row transversely across the street, with the blocks close together as they will set. The next row corresponding with that are set an inch or inch and a half, so as to form a cell or cavity, with the fiber of the wood perpendicular, or so as the ends of the fiber are exposed to the travel.

28th. Leaving the wooden foundation out of the question, is there any essential difference between the methods of Austin and Stead, except that in Stead's patent the blocks are placed close together, whilst in Austin's patent they have the spaces left between them, as you have explained, and such spaces filled with concrete of gravel, or stone and tar?

(Objection. Objected to as leading, and advising the witness with respect to the difference of the 2 patterns enquired of.)

Ans. The wood or blocks are placed in the same condition,
634 with the exception, as I have explained heretofore.

29th. Do you know, and if so, state whether Nicholson's 2d method consists of wooden blocks? If it does, are such blocks cut transversely or otherwise, and how? How are such blocks placed with reference to the fiber of the wood, and also in reference to their nearness or proximity to each other?

Ans. My answer to that question would be the same as I answered in the Austin essentially. It consists of wooden blocks sawed transversely, with the wood placed transversely across the streets, as closely as they could be made to fit, with the fiber of the wood exposed to the travel perpendicular. We place another row of blocks within an inch or inch and a half parallel with it; in that space a strip is placed in the Nicolson method.

(Objection. Defendant objects to the last clause commencing "in that space" of the question as irresponsive to the question. It is not called for in the question.)

30th. Is there any difference, if so, what, between Nicolson's 2d method and Austin's method in the form or size of the blocks; in the way the blocks are cut; in the way the blocks are stood with reference to the fiber of the wood, or with reference to each other, or in the spaces made between them by the placing of the block?

635 Ans. No essential difference.

31st. Is there any difference in the filling up of the spaces between the blocks, except the strip of wood you have already referred to? if so, what is it?

Ans. No difference.

32nd. What is the object or purpose, if any, accomplished by placing that strip of wood between the blocks?

Ans. It is claimed the object is to hold the blocks in their places. I don't think they accomplish anything by it—as a benefit to the pavement.

33rd. Do you regard the use of that strip as an instance of inventive skill, or is it an expedient which would readily suggest itself to any practical workman employed in that kind of business, or how do you regard it?

Ans. I do not so regard it; I consider it an expedient which would suggest itself to any ordinary workman.

34th. Keeping in view the cost and all the practical purposes of a wooden pavement, is there any substantial difference, and if so, what, [what] in the products; that is, in the pavement produced by
636 Nicolson's 2d method and the pavement produced by Austin's method?

Ans. There is no essential difference.

35th. Do you know of any pavement similar to Nicolson's 2d method pavement where the strip has been merely introduced edgeway between the blocks without being nailed to its place? if so, when and where was that pavement constructed?

Ans. On Lake st., in this city, as I have already explained, it was laid with the strips slightly nailed every 4 or 6 courses, in 1861.

36th. How long did that pavement stand before the strips began to work up?

Ans. The first that I observed it, it was laid in the fall; and the following summer I observed it.

36th. How would a pavement so constructed, that is with the strips introduced edgewise between the blocks not [not] nailed, compare with Austin's method for compactness, durability, or any other of the practical purpose of a wooden pavement?

Ans. It would be a very inferior pavement if the strips were not nailed to the floor or foundation to any other wooden pavement that I know of that has ever been laid.

637 38th. Have you had occasion to estimate the cost of a pavement similar to Nicolson's 2nd method, but with the addition of nailed strips, and also to estimate the cost of the Austin pavement with the blocks toe-nailed merely? if so, on what occasion was each estimate made, and when, and what difference, if any, did you find in the cost of constructing them, respectively?

Ans. I have had occasion to estimate the cost of a pavement similar to Nicolsons' 2d method with the addition of nails in the strips, also to estimate the cost of the Austin pavement with the blocks toe-nailed merely; the board of public works advertise for the improving of Wells st., with wooden block pavement with strips or without strips. I, through John McMahon, made a bid for Wells st. to put the pavement down for so much per yard with or without strips. I made no difference in the material; there was a trifle difference in favor of the Austin pavement, which was a trifle cheaper.

39th. Take the Austin method and its product as one sum; take the Nicolson 2d method and its product as another sum, is there any, and what, material difference between these two sums?

Ans. The difference in the two sums would be in favor of the Au tin pavement of three cents p'r yard, if I understand the question.

638 40th. Does the Nicolson plan, as stated in his second method, when the strips are merely introduced edgwise, make a better or cheaper pavement than this Austin pavement? if so, in what respect?

Ans. No; it does not.

41st. Are you acquainted with the method of constructing the wooden pavement of Crannis & Kemp, as set forth in the specification Exhibit "F?" if so, is there any, and what, difference between the mode of producing the cells produced by Nicolson's first method and the cells produced by Crrnnis & Kemp?

Ans. I understand the mode how the cells are produced in Crannis

& Kemp's patent, the blocks are even lengths; the blocks are laid so that the cells come against the block.

Witness examines the printed specifications in the Exhibit "F," and states one-half the blocks are sawed one-half the length of the other and set vertically on the street with the grain of wood exposed as in the Austin pavement; the blocks, I should state, were square blocks; the long ones and short ones are set together; the cells are formed by one block being sawed one-half the length of the other, so that each alternate block is a long block, and each alternate block is a short one, so as to form cells; the cells produced by Nicolson's 1st method is the same as Crannis & Kemp.

639 42d. What is the office of the wooden floor or foundation described in the specification to Nicolson's reissued patent?

Ans. It is to hold the pavement even.

43d. Would tar-paper be an equivalent for such floor or foundation, and would it hold the pavement even?

Ans. Tar-paper would not be equivalent to floor foundation; and furthermore, it would not hold the pavement even any more than gravel or sand or clay, and would be no use there, in my opinion.

44th. Can a wooden pavement on Nicolson's 2d method be constructed and maintained as a useful pavement for a public street without a wooden floor or foundation or its equivalent?

Ans. Leaving out the question of cost I think it could, by a solid concrete foundation.

640 *Cross-examination.*

SEPT. 26.

1 x. You say you have been engaged in the paving business for 16 years; has that been your sole occupation during that time? and if not, in what other business have you been engaged?

Ans. I have been engaged every year during that time, more or less, in the paving business; I have been in other business in the winter season, such as buying and selling real estate and building houses in Cincinnatti, and shipping produce to New Orleans. The most of the year 1860 I was in the State of Mississippi; contractor on the Mobile & Ohio railroad a portion of that season.

2 x. What proportion of your time during said 16 years has been given to paving?

Ans. Something over one-half; probably two-thirds.

3 x. What proportion of your time, previously to your coming to Chicago, was given to your paving?

Ans. Same proportion.

4 x. Have you been all that time engaged in laying wooden pavements? and if not, what other kinds of paving have you been engaged in laying?

Ans. I was engaged in laying from the time I commenced
641 contracting for paving up to 1861, laying boulder stone, quarry lime-stone, McAdamizing and graveling; the latter part of the season of 1861 I took a contract for laying a wooden pavement on Lake st. from east line of Wabash Ave. to Lake st,

bridge, which I fulfilled that season. The next season I had a contract for laying wooden pavement on Lake st. from Central ave. to Wabash ave; also the same season a contract for laying on South Water st. from Franklin st. to Lake st. The next year I took a contract for a wooden pavement from Halsted st. to the railroad bridge.

5 x. Was the paving of Lake st. in 1861, above referred to by you, the first wooden pavement you ever laid? and if not, state what was the first, and when and where it was laid.

Ans. It was the first.

6 x. State whether all the wooden pavements referred to by you in your answer to the 5th cross-interrogatory were or not the wood pavement known as the Nicolson pavement.

Ans. That was the name they were known by.

7 x. With the exception of the piece of wood paving, 16 by 26 feet, laid by you as a part of the intersection of Clark and
642 Randolph streets, called by you the Austin pavement, what other wooden paving have you ever laid or had any particular experience with, except the pavement known as the Nicolson pavement? If you say you have had any other, state when and where it was, and describe such other particularly.

Ans. I have laid no other wooden pavement, with the exception of that I have already mentioned.

8 x. Were you not engaged in Chicago in laying stone pavements before you laid the Nicolson in 1861 on Lake st.? and if so, to what extent?

Ans. I was engaged in laying stone pavements. I paved Lake st. with stone in 1855 and 1856; I paved in 1855 from the Central Depot to the centre of State st., and in 1856 from State st. to the bridge on Lake st.; and I paved South Water st. in 1856 from Franklin to Clarke. In 1857 I paved State st. from Lake to Madison, besides some other smaller jobs. In 1858 I paved State st. from Madison st. to 12th st. All these were paved with boulder stone. Same year I paved, in connection with others, Dearborn st. from Randolf to Madison, with quarry limestone. In 1862, I think, I paved Kinzie st., in connection with others, from Clarke to Rush st., with boulder stone. I have McAdamized several other streets in Chicago.

9 x. Did you not, as a stone paver, or person interested in
643 stone paving, oppose from the first the introduction of the Nicolson paving into Chicago, and strive to prevent its being adopted by the city on Lake st., Clark, or other streets?

Ans. I did not oppose the wooden pavement being put down as a private interest, but as a public good. I believed it to be for the interest of the city to pave with boulder stone, if suitable stone could be obtained at a fair price, and still believe it. It would not have effected my private interest putting down wooden block or any other pavement. I had not at any time material on hand, except for the jobs I had taken. My profits in the wooden paving were as much, if not greater, than they were in the stone paving.

10 x. Did you or not, in fact, oppose the introduction of the Nicolson pavement into Chicago?

Ans. Believing it to be for the interest of the city I opposed it.

11 x. Were you not active and zealous in your opposition to its introduction?

Ans. I was not materially so.

12 x. Did you not talk against it, write against it, seek to influence members of the council to vote against it, and to influence
644 property owners to petition against its adoption? Or, if not all of these, which of them?

Ans. I never wrote a word against it, as I know of, in my life. In regard to the other points of the question, I will say I did.

13 x. Was there not an excited discussion on the subject, attended with a great deal of feeling, and did you not become an active partizan in such controversy?

Ans. I heard the subject discussed a great deal. I was not aware of an excited feeling on the subject. As far as I had anything to say I advocated the boulder pavement. I did not become an active partizan. I advocated the boulder pavement as far as my interest was concerned. I understood the question applied to public interest, and believe that at the same time the public interest would be promoted by the boulder pavement.

14 x. You say your profits on the wooden block pavement have proved to be equal to those on the stone paving. At the time of your opposition to the wood paving you had not laid any of the wood pavement and were ignorant in respect to the question of profits from any practical experience of that pavement, were you not?

Ans. When Mr. Greeley laid the first square of wooden pavement here in Chicago, on Wells street, in November, 1856, and
645 July, 1857, I did not oppose it. I became satisfied in my own mind, after a year and a half or two years after that had been laid down, it would not be for the interest of the city. Yes, sir; I was ignorant as to the question of profits on the wood pavement at that time.

15. Please make a chart or plan of the intersection of Randolf and Clark streets, and designate on the same, as nearly as you can, the location of the curbs and gutters and of the street rails, and of the piece of so-called Austin pavement with respect to the same.

Ans. I'm no draftsman, but can make a rough sketch. (Witness here produces a rough draft marked Exhibit "A," made by him at the time in response to the last question, and states:) The line "B" "C" represents the west line of Clark st. and the line "D" "E" the east line of Clark st. The lines 1, 2, 3, 4 represent the curb lines of the same street. The lines H, I, F, G represent the curb lines on Randolf st. The line 5, 6 represents the north line of Randolf st. The line 7 8 represents the south line of Randolf st. These sidewalks are 16 feet in width, the spaces between the respective sidewalks are called the wings of the intersection. The space "A" between is the west wing between the sidewalk and the horse railroad track, extending the width of sidewalk and

reaching to the railway track, and being 16 by 26 or 28 feet, is the piece referred to by me as laid with the Austin pavement.

646 The point marked "Y" in that intersection is where the Austin pavement was taken up for the comparison referred to by me in my direct examination, and the point "Z" was the point where the Nicolson pavement was taken up for the same comparison. Clark and Randolf streets are each 80 feet in width, including sidewalks. 9, 10, 11, and 12 represent the intersection of the roadway.

16 x. At the time this was laid down, had Clark street, on each side of the intersection, been previously paved with the so-called Nicolson paving?

Ans. It was paved with wooden block pavement, so-called Nicol son paving, at that time.

17 x. Had the intersection of the roading at Randolf st. been paved with the so-called Nicolson paving?

Ans. It had not.

18 x. With what kind of wooden pavement were the other wings of the intersection and the intersection of the roadway laid?

Ans. It was laid with the so-called Nicolson.

19 x. By whose direction was this piece laid with the so-

647 called Austin pavement?

Ans. By consent of the board of public works.

20 x. By whose request or solicitation was such consent obtained?

Ans. By mine.

21 x. Did you make such request, or obtain such consent with a view to obtaining evidence to be used in litigation connected with the Nicolson patent?

Ans. I did not.

22 x. Did yon make the same with a view to obtaining evidence adverse to the Nicolson patent?

Ans. I did not.

23 x. Had you in view, at the time you laid the said piece of the so-called Austin pavement, the possible or probable use of it as evidence in litigation respecting the Nicolson patent?

Ans. I did not. I merely laid it as an experiment. I had no such idea in my head.

648 24 x. Did you not state in your answer to the 18th direct int. yesterday that the purpose for which this comparison was made, was to take the testimony in this trial, or to see which was best?

Ans. When I stated in my direct testimony that the experiment was made the latter part of July, 1865, I had a different reference from what I had when the pavement was laid down in 1863?

25 x. Was there not in May, 1863, when this alleged Austin pavement was laid down, a suit pending in the U. S. Circuit Court in this district between the plaintiff and defendant for a violation of the Nicolson patent, and was not the existence of such suit known to you at the time?

Ans. If my recollection serves me right, there was no suit pending at that time. I am not certain about dates.

26 x. Did you know at said time of their having been such a suit instituted previously?

Ans. It might have been and it might not. I know there was such a suit, Nicolson prosecuted the city of Chicago and DeGolyer and McClelland.

27 x. In said suit had you assisted in the preparation of the defence, or counselled or advised as to the same?

649 Ans. I did.

28 x. Was not the said Austin's mode of constructing paving one of the defences set up to said Nicolson suit?

Ans. It was.

29 x. Were the said plaintiff, Nicolson, or his agent, or his attorneys or any party representing his interests advised or notified that such an experiment was to be made?

Ans. Not by me.

30 x. Had they, or either of them, any knowledge or notice of the same as far as you know?

Ans. No, sir.

31 x. In July, 1865, when the said alleged Austin pavement was taken up and a portion of the said pavement known as the Nicolson was taken up for the purpose of the comparison in respect to which you have sworn and for the purpose of being used as evidence in this suit as sworn to by you, were either plaintiff or his agent or his attorney, or any person representing his interest, notified that such comparison was about to be made, or were either of them present when the same was made?

650 Ans. Not to my knowledge,

32 x. Were you not at said time aware that the present suit was pending and that the plaintiff had attorneys in this city but one block distant from the place where such experiment was being made?

Ans. I was aware that a suit was pending, but was not aware where the office of the plaintiff's attorney was.

33 x. Did you know that the firm of Goodwin, Larned & Goodwin were the attorneys?

Ans. I had heard they were.

34 x. Was the laying of the said piece of Austin pavement made known by you to the plaintiff, or his attorneys? and if so, when and where?

Ans. I don't recollect that I ever did make it known. I don't recollect that I ever had any conversation with the attorneys on the subject.

35 x. Was not the laying of the said piece of so-called Austin pavement kept secret by you, and was it not understood between you, by you and the board of public works, or by either of you, that it was to be so kept a secret when it was?

651 Ans. It was not.

36 x. When you made said examination of said pavement for comparison was it understood by you and the board, or either of you, that it was to be done privately without the presence of any one in the interest of the plaintiff?

Ans. No such understanding, or nothing of the kind to my knowledge.

37 x. Did you observe, or did it occur to you, while making such so-called examination, for the purpose of making evidence in this cause, that there was no party present at the same to represent the interest and rights of the plaintiffs in this suit?

Ans. It don't occur to me now that I had any such idea in my mind; I did not know it was necessary for plaintiffs to be present.

38 x. Did you regard it as a fair and proper mode of investigation in such a case to take up and examine the pavement claimed by the plaintiff and compare it with another pavement set up to defeat his invention in his absence, and without his knowledge, when the facts to be thus obtained were designed to be used in evidence to effect his right?

Ans. I did'nt consider it my business to investigate the fairness of such proceedings, and I did'nt give it any thought on the subject particularly.

652 30 x. Did you not, in 1862 and 1863, yourself, have a controversy or litigation with S. S. Greeley in relation to a sum claimed to be due to him from you for license fees upon the contract taken by you for the laying of Nicolson pavement on Lake st.? and in that controversy, did you not, yourself, undertake to invalidate the Nicolson patent and seek an opportunity to set up such invalidity to defeat said action?

Ans. DeGolyer and McClelland had such a controversy at that time. The firm of DeGolyer & McClelland did undertake to invalidate the Nicolson patent in that suit.

40 x. Did you not at said time, or subsequently, represent to the board of public works, or members thereof, or its officers, that the said patent was invalid, and you could prove it to be so, and were you not the first person in the city to advise them to that effect?

Ans. I represented to the board of public works that the Nicolson patent, as he claimed in 1854, I believed to be invalid, because the pavement that I had laid down here was not in accordance with what he claimed in his original method, his reissued patent; I have had no controversy about it, nor have I advised about it.

41 x. Was it from you, or through your inquiries or investigations, or through those of the council employed by you, that the city
653 was first notified and advised of the Austin patent and the other English patent referred to by you in your direct examination?

Ans. It was through the agency of DeGolyer & McClelland and the city jointly, that the Austin and other English patents were brought to light and made use of in defending the suit.

42 x. State whether the same attorney employed by you to defeat the patent in your suit with Greeley is now acting as one of the attorneys for the defendant in this suit?

Ans. Yes, sir.

43 x. Are you personally acquainted with Samuel Nicolson, the plaintiff in this suit, and have you had any conversation with him in

regard to his patent and in regard to the Austin patent at any time, and did you have any such conversation at or about the fall of 1863 or the summer of 1864.

Ans. I have had short acquaintance. I know him personally. I had some slight conversation in regard to his patent right and whether Austin's patent right was mentioned in the conversation I am unable to recollect. I do not recollect of having any direct argument with Mr. Nicolson on the subject of the validity of his patent.

44 x. Did you in a conversation with him, had at or about the
654 fall of 1863, or the summer of 1864, make a statement to him in substance as follows, to wit: that you had caused a small piece of pavement to be constructed in Chicago after the plan described in Henry Austin's patent on Clark and Randolf streets and that you found the same troublesome and more expensive in construction than the Nicolson, and that you had abandoned the experement, or words to the like import or effect?

Ans. I have no reccollection of any such conversation.

45 x. In reply to such a remark as above stated; did not the said Nicholson say to you, that if you would continue to pave after the Austin method he would make no complaint, provided, you would not make use of his invention?

Ans. I don't reccollect of any such conversation, or of his making any such observation.

46 x. Do you mean to state that such statements were not made by you to Mr. Nicholson, or that you do not reccollect making them?

Ans. I mean to say just as I answered; that I have no recollection of such statetments.

47 x. Give the names of the workmen who were employed to lay down the said so-called Austin pavement; and state when the work commenced and when finished; and what amount of time was occupied in it.

655 Ans. James McKinnon was foreman, Thomas O' Bryan's business was to put on the gravel and put in the tar; the other names I don't recollect; I had different men working for me every few days; it was commenced in May 1863; I don't know the day of the month or of the week; it was commenced one day and finished the next, so far as the Austin was concerned.

48 x. What was done with the blocks which were taken up by you in July last for comparison?

Ans. I don't know positively; but heard they were retained by the city.

49 x. Whose were the blocks prepared for such piece of paving? by whom brought to the place of laying? and where placed before being laid, and what was the length, width and height, of such blocks?

Ans. They were three-inch pine plank hauled to near the court-house square corner on Randolf street, and there sawed in length of 6 inches and taken from that point; when they were sawed and laid down by the workmen; the length varied from 6 to 24 inches; height 6 inches, width or thickness 3 inches.

50 x. Can you state the whole number of blocks which were used in the piece so paved?

Ans. I can not, sir.

51 x. Was more than 1 nail used for 1 block?

656 Ans. No, sir.

52 x. Can you state the whole number pounds of nails which were used for the whole piece?

Ans. No, sir.

53 x. Can you state the number of hours or day's work occupied in the entire construction of the said Austin piece?

Ans. I can not, sir.

54 x. Was any separate account kept of the amount and cost of material, and amount and cost of labor, in the construction of said Austin piece? if yes, who kept such account, and where is it?

Ans. I kept no separate account of the labor of, and materials in, the Austin pavement, as we were at work at the same time in laying the whole of the intersection.

55 x. Was the entire intersection at that corner laid with blocks before the channels or cells were filled with gravel and tar, or was the piece you call the Austin laid and filled with the gravel and tar, and completed separately before the remaining blocks of the intersection were laid?

Ans. We treated the Austin the same as the other—paved it right along; we always followed along with the tar and gravel as
657 near as we could to the pavers; we followed with our labor.

56 x. You say it was commenced one day and finished the next; do you mean the special piece you call the Austin or the whole intersection?

Ans. I mean the special piece. I would add the workmen were not all the time at work with that; the whole work was going on the same.

57 x. When was the balance of the intersection other than the Austin begun, and when was that finished?

Ans. The whole work occupied 8 or 9 days; I don't recollect precisely.

58 x. Do you recollect whether the blocks were laid from curb to curb before the filling was put into them, or have you any distinct remembrance of the filling being put in before all of the blocks had been laid?

Ans. The blocks were laid from the curb line of the street to the railroad track, and the filling of gravel was put between the blocks instead of in the blocks—after the blocks were laid; sometimes we were further ahead with the paving, and sometimes the filling was kept closer to the pavers than at others.

59 x. Did you not perfectly understand my question to mean that the filling was to be placed between the blocks?

658 Ans. I understand your question to mean just exactly as it was read to me; I had no right to infer anything else.

60 x. You swear then that you understood I meant to state in said question, and you so understood it, that the filling was to be placed in the blocks instead of between them?

Ans. I do not swear to what you meant; but to what you read to me; how could I know what you meant?

61 x. Were the blocks in the so-called Austin piece upon a tarred board foundation?

Ans. Yes, sir.

62 x. Was the composition placed between the blocks in this intersection rammed down or not?

Ans. It was intended to be—the whole of it; I saw it being rammed, and I believe it was all rammed.

63 x. At what stage in the process of the work was the ramming done?

Ans. After the blocks were laid and the cells or interstices filled with gravel and tar.

64 x. At the time when you saw it being rammed had the whole of the intersection been laid with the paving? and if not, what part was then laid, and what part was then unlaid?

659 Ans. The ramming followed up the tarring closely; the whole intersection was not finished when the ramming was commenced. We first paved the west wing on Clark street, and while the workmen were engaged on the intersection of the roadway, the north wing was graveled, tarred, and rammed; and when the pavers finished the intersection up to the railroad track, we then graveled, tarred, and rammed that while the pavers were laying that portion called the Austin pavement being on the west wing.

65 x. Upon what is the street-rail at that point laid? and if upon a sleeper, what is the depth or thickness of such sleeper?

Ans. It is laid on sleepers, and they are of the depth or thickness of 6 inches.

66 x. Against what did such piece of so-called Austin paving abut on the western side or end?

Ans. The boulder stone.

67 x. That piece of so-called Austin paving I understood you to say is the only piece of such paving that you have seen constructed?

Ans. I don't know of any other.

660 68 x. Which, in your opinion, would be likely to be the most durable, a wooden pavement in which the blocks were of greater thickness, but so placed as to be liable to be forced out of position, lifted up from the bottom by water or by pressure, or one of less thickness, which maintains an equal and uniform bearing and wear throughout its whole surface?

Ans. I can give no intelligent answer to that question.

69 x. Would a pavement of wooden blocks of any thickness, practicable for convenient construction and use, be durable if the blocks composing it were so laid as to be easily forced out of position, so as to become elevated and depressed unequally in different portions of its surface?

Ans. I should think not, sir.

70 x. If a wooden block paving was so constructed that its blocks should become by wear or use elevated or depressed unequally, making holes or leaks between said blocks or beneath them, by which the

surface water could be conducted beneath, would it not tend to rock such paving, and also to cause it to be upheaved by the freezing of the water so introduced beneath it?

Ans. That would be the result of it.

71 x. Is it not a matter of essential importance to the durability of a wooden paving composed of blocks with gravel and broken stone, and in combination with such blocks, that such composition of
661 gravel, stone, &c., should be prevented from getting beneath the blocks constituting such paving?

Ans. Yes, sir.

72 x. If such composition of gravel stone, &c., should be thus forced beneath the blocks, would it not tend to loosen, upheave, or force them out of position.

Ans. Yes, sir.

73 x. Does not the short block or strip in Nicolson's 2nd method in combination with the long, in the manner described in the specification of said patent, by removing the bottom of the channel or cell containing the composition of gravel, stone, &c., at a little distance above the point of intersection of the long blocks with the foundation, make it difficult, if not impossible, for such composition to be forced beneath the long blocks.

Ans. It does make it difficult; it's not an impossibility, but the gravel may get down to the bottom of the foundation or the cell.

74 x. Practically speaking, does not such an arrangement, when properly laid and constructed, render it impossible that any of such composition should be forced beneath the long blocks to any extent appreciable as a cause of injury to the paving.

662 Ans. There is no probability of the gravel or sand getting under the blocks or beneath them under any circumstances.

75 x. If the blocks were simply placed upon the foundation, with no strips or blocks between, and not nailed or glued thereto, do you mean to state that there would be no probability of the gravel, sand, &c., getting beneath them?

Ans. I do.

76 x. Is there anything in the specifications of either the original or reissued letters patent of Nicolson which requires that the short block should be of half the height of the long one? Is it not stated that it may be of such height? and may not such short block be of any height above the foundation which shall in practice be found most to conduce to the durability of the paving, so that it shall be made high enough above the foundation to furnish a bottom for the channel or cell containing the composition of stone, &c., sufficiently raised above such to prevent the possibility of the gravel, &c., being forced beneath the long blocks? If there is any such thing in either such original or reissued letters, please state what it is.

Ans. It is stated in such specifications; it may be such height, but in his plan or drawing he represents it as of that height. There is no necessity for any block to be there to prevent the gravel getting beneath the blocks. Mr. Nicolson, in his specification, does
663 not confine the short block to any particular length; he says, it may be one-half.

77 x. If it should be found in practical experience that the Nicolson paving would be available for use or travel to a point below the top of the short blocks as now constructed, would it not be equally within the meaning and provision of Nicolson's specifications and invention to reduce the height of the short block to such point as would give the utmost amount of wear, consistent with the declared object and purpose of such short blocks, of making a channel or cell elevated above the bottom of the long block sufficiently to prevent the gravel, &c., being forced beneath it?

Ans. It would.

78 x. Have you ever known any wooden block paving, composed of blocks of the size represented in the Nicolson specification and drawings, which wore down to a point as low as the short blocks of such paving before requiring to be wholly relaid? If so, state when such paving was laid and describe it.

Ans. Yes, sir; the paving was on South Wells st. between South Water and Lake; and there is one worn down to the pickets in portions, or even below it, at the intersection of Washington and Clark sts., which was laid according to Nicolson's 1st method; it was worn down so the long block in portions of the intersection were equal to the short ones.

664 79 x. State particularly the portions of the Wells st. paving which are worn down with sufficient accuracy to enable them to be examined and identified.

Ans. The centre of Wells st., between Lake st. and the alley opposite, which runs by the old Sturges Bank.

80 x. How large a portion of the paving is thus worn?

Ans. I should think, from recollection, about 10 feet from the centre each way, which would make about 1-3 of it, excepting when it has been repaired with new blocks.

81st x. How long in your opinion will this wooden pavement on Wells st. remain in a condition fit for use and travel?

Ans. It is now not fit for use and travel, it wants renewing—the whole of it.

82 x. How long has it been laid down, and has it been subjected to a great amount of wear.

Ans. The north part has been laid down 8 years and 10 months; the south part of it has been laid down 8 years and 2 months; it has been subjected to heavy travel.

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83 x. What was the height of the strip of block on Wells st. above referred to.

665 Ans. 3 inches.

84 x. If such paving has been constructed with the short blocks or strips 2 inches in height instead of 3, would it not have become unserviceable for travel before the wear had extended to the depth of the strip?

Ans. The shorter the strip, or no strip at all, the pavement would have been better. It would not.

85 x. To what depth or thickness of block, in your opinion, will a wooden block pavement wear down before becoming unserviceable for travel and requiring to be relaid?

Ans. The depth that would remain and still be serviceable might be 2 inches. I think if the blocks remained sound, it might be serviceable until it wore down to 2 inches.

86 x. Would your judgment be that wood blocks of 6 inches in depth, as now used, would be likely to continue sound up to the time that they should be worn down to within 2 inches of the foundation.

Ans. It would depend upon the wear of the travel on the streets; my judgment in the matter would be they would decay in 9 or 10 years.

87 x. If in 8 years and 10 months they have only worn on
666 Wells st. the depth of 3 inches in parts, and less in other parts of the paving, how long would it take to wear away 1 inch more from the block, leaving 2 inches remaining.

Ans. I can't answer that question, because I have had no practical knowledge; my opinion is the lower the blocks get the faster they will wear; at the same ratio it would take a year and a half more to wear down an inch more.

88 x. Suppose the strip or short block should be made 1½ inches in height instead of 3, would it not furnish the channel or cell raised above the bottom of the long blocks for the reception of the filling as required by the Nicolson specifications, and would not such paving become unserviceable for wear before the tops of the short blocks were reached?

Ans. My opinion is it would not.

89 x. Did you not just state in your answer to the 85 cross-int. that a wooden pavement would remain serviceable for travel when worn only to the depth of within two inches of the foundation, provided the blocks remained sound.

Ans. I did so state on the presumption that the short blocks or pickets were 3 inches deep when laid. In my opinion, the pavement would remain serviceable until it reached the short block or the inch and a half block.

667 90 x. Give us your answer to the 88th cross-int., substituting 1 inch for 1½ inches, as the depth of the short block.

Ans. I think a pavement would remain serviceable within one inch of the bottom of the long block, provided the filling was stone and composition.

91 x. In your answer to the 85 cross-int. you stated it might remain serviceable if the blocks were sound to within 2 inches of the foundation; in your answer to the 89 you stated you made the former answer upon the presumption that the short blocks were 3 inches deep when laid, and that, in your opinion, a pavement would remain serviceable until it reached within 1½ inches; in your last answer you say it would remain serviceable until within an inch of the foundation. Please explain what your judgment and opinion is in respect to the depth from the foundation to which a wooden pavement constructed of blocks formed into channels, filled with the composition

filling referred to in Nicolson's or Austin's methods, would wear before becoming unserviceable by rot, displacement, or other causes, or requiring to be relaid.

Ans. To those 3 questions, as enumerated, I answered as stated. A pavement composed of blocks and gravel and composition for filling would last longer and wear down nearer to the foundation, and remain serviceable longer than a pavement wholly of wood. My opinion is the Nicolson method would remain good, provided the
668 blocks remained sound down to 2 inches; it might remain longer. The Austin method, in my opinion, would remain serviceable, if the blocks were sound and the foundation good, until within an inch of the foundation.

92 x. Answer the 88th question again, substituting $\frac{3}{4}$ of an inch in the place of an inch and a half.

Ans. I think it would become unserviceable worn down to $\frac{3}{4}$ of an inch in either Nicolson's or Austin's method.

93 x. In your answer to the 88th int. you state the Nicolson pavement would not become unserviceable if worn to within $1\frac{1}{2}$ inches of the foundation. In your answer to the 91 x. int. you state that it would remain good if the blocks were sound, and foundation good until the blocks were worn down to 2 inches, and might longer; which of these 2 opinions is correct?

(Objection. Objected to the last clause of the int. as it assumes one of the opinions referred to is incorrect.)

Ans. Both of those opinions are correct; one is given on the presumption that the short blocks or strips are three inches wide; the other is given on the presumption the strips are $1\frac{1}{2}$ inches wide in the Nicolson method. In the Austin method it is given on the presumption there were no strips or short blocks.

94 x. I suppose a paving constructed of wooden blocks with
669 strips between such blocks of the depth of one and a half inches forming channels filled with the gravel or stone and composition; to what depth from the foundation would such blocks wear before becoming unserviceable or requiring to be relaid?

Ans. If the blocks remained sound and the foundation sound, in my opinion, it would remain serviceable until it reached the strip $1\frac{1}{2}$ inches from the foundation.

95 x. Answer the last ques., substituting $1\frac{1}{4}$ inches in the place of $1\frac{1}{2}$ inches.

Ans. With the proviso in my last answer, I think it would remain good to the strip.

96 x. Answer the 94th question, substituting 1 inch in the place of $1\frac{1}{2}$ inches.

Ans. With the proviso, as before, I should think it would remain in a serviceable condition to or near the strip.

97 x. How near the strip do you mean by your last answer in stating to or near it?

Ans. It might remain good to within one and one-eighth of an inch.

98 x. In your answer to the 91 cross-int. you state that the
670 Nicolson method would remain good if the blocks were sound

and the foundation good until the blocks were worn down to 2 inches, and might longer; in your answer to the 93 x-int. you state the Nicolson method would remain good if the blocks and the foundation were good until the blocks were worn down to 2 inches, and might be longer, when the strips were 3 inches in height. In answer to the 88th you state the Nicolson pavement would not become unserviceable if worn within $1\frac{1}{2}$ inches of the foundation when the strip was $1\frac{1}{2}$ inches in height; you now state in your last answer it might remain good to within $1\frac{1}{8}$ inches from the foundation. How do you reconcile these various opinions with one another?

Ans. There is not substance enough in an inch strip to hold the wear and tear of the travel on the streets when the filling of the composition of the gravel and tar is gone, the depth remaining of 1 inch of the blocks; my opinion is they would very soon go to pieces or require renewing. The theory is this, that a combination of gravel and tar will last longer and wear to a shorter depth, than if it was all wood.

99 x. In the combination of the Nicolson paving is it not usual to make use of the block as soon as laid and before filling for the passage of men and teams over them bearing the material to be used in the further construction of the paving?

Ans. Yes, sir.

671 100. To what extent does the laying of the blocks usually proceed or be in advance of the filling?

Ans. From 10 feet to 50 or 60, as it happens; there is no particular rule about it.

101 x. Would it not be difficult and inconvenient in practice to fill each channel or cell as soon as made, and does it not conduce to the facility and convenience of construction to have a considerable area of blocks laid before commencing the filling?

Ans. It would facilitate the work to keep within 10 feet of the block laying with the filling, instead of filling each row or cell as made.

102. Have you had any practical experience other than as derived in laying the little piece of the intersection before referred to? and if so, state what and where, of the capability of maintaining in their correct position blocks of the height of 6 inches without any support, except a nail or gluing to the foundation. Did you ever see teams driven over blocks in that condition loaded with materials for the further construction of the work?

Ans. I have had no other practical experience than that referred to. I don't recollect of any teams passing over them before the gravel and composition was put in; the gravel was not put in until the day after it was laid. There was a large amount of foot

672 travel passing over it; the blocks remained in their proper position.

103 x. Would there, in your opinion, be no liability to displacement of the block of the height of 6 inches having no other support than a nail or glue by the passage of loaded teams over them containing the necessary material for the progress of the work?

Ans. I think there would to some small degree.

104 x. If the passages of teams over the blocks with the material

required for the prosecution of the work could not take place without displacing the blocks when laid as above stated, how could such material be conveniently conducted to the advanced section of the work?

Ans. We never wanted to go nearer to our advanced work than to within 20 feet of where the workmen were laying the blocks, and when the stone filling is in there is no danger of the displacing of blocks by the passage of teams.

105 x. Is it not found convenient, and is it not the usual customary way in constructing the Nicholson, to bring the boiler and instruments for the preparation of the tar, the gravel, and other substances, over and deposit them upon the paving before any filling is begun?

Ans. The boiler is never within less than about 75 or 100 feet from where the workmen are engaged laying the blocks; it always
673 remains on the portion which is finished; the gravel is brought on the portion that is finished, and then dumped and dried or heated, and wheeled to points where the filling is being made, by wheelbarrows.

106 x. In the Austin method, if practical experience in its construction on an extensive scale should demonstrate that the filling was forced beneath the blocks so as to displace them, would it not constitute a serious objection to such paving?

Ans. I think it would.

107 x. Are not long and short blocks or strips so combined as to form a cell or channel whose bottom shall be the top of the short block or strip, specially described in the Nicolson patent as one of the essential features of his combination? and are not the blocks in the Austin method, described in his specification as being of a uniform height, and so arranged as to form channels or cells reaching to the entire depth of the blocks?

Ans. I understand it is so described in Nicolson's patent, and that Austin's method is as stated in the question.

108 x. Is there any provision, and if so, what, in the Austin combination for tarred paper or any other substance to be used in combination with the board or other foundation on which the paving blocks are to be placed to prevent the absorption of moisture from below?

674 I think there is no provision, with the exception of the glue. This is put on to the plank or boards.

109 x. Do you, then, consider the glue put upon the boards a preventive of moisture?

Ans. I consider glue a more temporary preventive.

110 x. How long would glue act, in your opinion, to prevent moisture?

Ans. Until it gets wet.

111 x. Is not a support for the blocks, other than the prepared road-bed and the interposition of some substance between the ground and the bottom of the blocks to exclude or prevent moisture being absorbed by the blocks from below, one of the elements or features described by Nicolson in his specification?

Ans. There is some such direction given by Nicolson in his method; he says it may be boards or tarred paper.

112 x. Is the combination of channels or cells filled with gravel, stone, and tar, said cells formed of long and short blocks so placed as that the bottom of the same shall be so elevated above the bottom of the long blocks, with a foundation of some substance capable of excluding or preventing moisture being absorbed from the ground beneath, found in any one of the patents you have named? And
675 if so, state in which of them, and point out particularly the language and words in the specifications or claims by which such combination is described.

Ans. I don't recollect that it is.

113 x. You say in your answer to the 22d direct int. that you are acquainted with the materials and method of construction of David Stead. Does said Stead require for his pavement any other foundations than the surface of the earth, which surface is to be uniformly brought to the required grade and figure?

Ans. No, sir; I think not.

114 x. Has said Stead long and short blocks other than the hexagonal and triangular blocks which he directs to be laid in course the long ones above, and resting upon the shorter ones?

Ans. I don't know that he has long and short blocks. If I recollect right his specifications require blocks of a uniform length set vertically.

115 x. How many forms of blocks does Stead give?

Ans. I don't recollect of but one.

116 x. Are the blocks in all the forms in Stead's patent,
676 except figures 21 and 22, laid close together, so as to avoid all cavities, except those caused by the peculiar form of the blocks, which cavities in such case go through to the bottom of the pavement.

Ans. I don't see any other form; they are so laid.

117 x. In the modification in figure 21 and 22, in Stead's patent, how are such blocks cut to the required shape?

Ans. The block is made solid, and the portion forming the groove is cut out of the solid block.

118 x. Are they not cut entirely around out of the solid block, forming grooves on every side of the top surface of the blocks, as laid in such way that the upper portion remaining after such cutting stands entirely isolated, and without other wood or timber support save that which it derives from the strength of the cut block itself?

Ans. You have correctly described in your question the manner in which the groove is cut in figure 21.

119 x. Are not such blocks united or brought together at their bases, and is not that a necessary peculiarity of the blocks in Stead's arrangement?

Ans. Such blocks are set close together at the base. The last part of the question I am unable to answer whether it is a necessary peculiarity or not.

677 120 x. How does Stead direct the longitudinal and transverse channels formed by cutting away the upper ends of the blocks to be filled?

Ans. I can't answer it by memory.

121 x. If these channels are not filled at all, would not the unsupported projections of the cut away blocks split or exfoliate so as to wear away rapidly, and also to expose the fibre of the wood so as to increase the absorption of moisture and falling water into the blocks?

Ans. If it was soft wood, such as pine, it is plain it would; but if hard wood, such as maple or oak, it would cause the street to become rough and uneven, more like the boulder pavement.

122 x. Is not the Stead block of figures 21 and 22 an expensive one, both as to cost and construction, waste of material, and time required for its manufacture?

Ans. I should think the expense, judging from the drawing, would be more than any other plan I have yet described, but I have made no estimate of it.

123 x. Did you ever see or know any pavement laid on either Stead's plans, or see any of such pavement laid or used?

Ans. As near as I can recollect now, about 20 years ago I saw a pavement in New York, similar to fig. "1," at the Staten
678 Island ferry, Castle Garden, and near the Bowling Green. I never saw any other plan of Stead's laid.

124 x. You say in your answer to the 39th direct int. that you understand Crannis & Kemp's patents are not, according to your recollection of such patents, a strong foundation and a mosaic pavement for court-yards and stables, the principal object for the invention described in that patent, and the grooves in all forms of blocks, constructed especially for the purpose of preventing horses' feet from slipping.

Ans. If I understand their patent correctly, it is adapted to courts, sidewalks, drives, and public highways, and the grooves are cut to prevent the horses and animals traveling over it from slipping.

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125 x. Did you not have a controversy with S. S. Greeley at the time he held an interest in such patent, and prior to the institution of his suit against you, before referred to, in relation to his share of the 12 per cent. interest for damages due on deferred payments on said paving, which had been retained, or supposed to be retained for him by the comptroller?

Ans. I had a controversy with him about it.

126 x. Did you or not, in a conversation had with said Greely in relation to such controversy, in which said Greely had insisted upon his right to such share or portion of said damages, say that
679 if he insisted on or demanded the same, that you would have your revenge if it took 10 years, or words to that effect?

Ans. I made no use of the words "revenge" or "10 years." I said it was unjust, and had no right to it, and Mr. Ward (the compt'r) had paid him without my knowledge.

127 x. Did you, as contractor under the city of Chicago, lay the pavement on W. Lake st., from the bridge to Halsted st., claimed in the bill in this cause to be an infringement upon Nicolson's patent?

(Objection. Objected to in so far as question premises that witness has read the bill or knows the contents thereof.)

Ans. I answered that in my direct examination that I did lay such a pavement.

128 x. Have you, within the last year, laid down, in the city of Toledo, Ohio, under a contract with said city, the Nicolson wooden pavement? And if yea, to what extent?

(Objection. Objected to as not competent on cross-examination.)

Ans. I don't know that it has anything to do with this—what I am doing in another State.

(Counsel asks to have question repeated to witness.)

680 Ans. I have laid down a wooden block pavement in Toledo. I can't tell to what extent. Don't recollect the No. of yards. I will state here in explanation it is different from what W. Lake is.

129 x. State particularly, and in detail, in what respect the said wooden pavement laid by you in Toledo, Ohio, differs from the said wooden pavement on W. Lake street, Chicago, referred to by you in your last answer.

Ans. The base or bottom of the blocks are tarred before laid; every block is nailed to the floor. The strips were two inches in depth instead of three, as on W. Lake st. between the blocks; there is no other material difference.

130 x. Is there about 5,000 yds. of the said wooden pavement in Toledo, referred to by you already laid? if not, state how near to 5,000 yds. the said wooden pavement amounts.

Ans. They have accepted, as I have laid, 4,763 yds.

131 x. How many yds., if any, of the said pavement in Toledo, referred to by you, have been laid by you, which the city has not yet accepted?

Ans. There may be between 800 and 1,200. I don't know exactly.

132 x. Have you agreed, and are you under contract with
681 the city of Toledo, to lay any further am't of the said pavement referred to other than those you have mentioned in said city of Toledo? If yea, to what am't.

(Objection. Objected to as incompetent on cross-examination.)

Ans. I made a contract with the city to lay, in addition to what I have mentioned—I can't tell exactly—I have not measured it, it may from 4,000 to 6,000 yds.

133 x. Did you, in conversation with Capt. Reuben Cleveland, of Chicago, in said city, about 2 or 3 years ago, say to said Cleveland that you would break down the Nicolson patent, or words to that effect?

Ans. I had a conversation with Mr. Cleveland somewhere about the time referred to, and said to him and others that Nicolson had no patent right for the manner in which it was being laid in Chicago, with the exception of the intersection of Washington and Clark sts., which I always contended he had a patent right to. (I refer to the patent of 1854.) I said to him and to others that I would'nt pay any patent fee on the pavement I was laying down, which I considered Mr. Nicholson had no claim to. I don't think I used the word break-

down. I might have made use of the word, or it might have been construed to that effect.

682 134 x. Was not the wooden pavement in Chicago laid by you, so laid under contracts and ordinances of the city of Chicago, directing the Nicolson wooden pavement to be laid by name?

(Objection. Objected to so far as it asks for the contents of the ordinances of the city.)

Ans. It was so stipulated in the contract. The ordinances I know nothing about. They are all a matter of record.

(Objection. Answer objected to so far as it purports to state the contents of written contracts.)

135 x. Did you not lay the various wooden pavement in the city of Chicago laid by you, as the Nicholson pavement by name?

Ans. I did.

136 x. Did you not say in the conversation above referred to by you with Mr. Cleveland and others that you would defeat Mr. Nicolson's claims to a patent fee for the pavement so laid?

Ans. As far as I was personally concerned I said that, or words to that import, so near as I recollect.

137 x. State, as near as you can now recollect, the time of the said conversation with Capt. Cleveland or others, which you have referred to in your foregoing answers.

683 Ans. I can't recollect exactly the time; it might have been somewheres about 3 years ago, as far as I know.

138 x. State about what time you first saw or heard of the specifications and patent of Henry Austin filed and obtained in England?

Ans. I can't recollect precisely. It was somewhere in the neighborhood of 5 years or 6 years ago I first heard there was such a patent. It must have been from 2 to 3 years ago I first saw the specifications. It might have been longer.

139 x. Had you or not seen the said specifications at the time you made your plea in the suit of Greeley against you in the Superior Court? and if yea, how long prior to the filing of such plea?

Ans. I can't recollect dates, but I will answer in this way: My impression now is that the specifications in detail in Austin's patent was shown to me about the time that plea was made; it might have been before or after.

140 x. From whom did you first hear of the said patent or specification?

Ans. I cannot tell. It was a general talk among those who were interested about town.

684 141 x. Do you mean to say that persons about town were talking about the patent and specifications of Henry Austin? If yea, mention any person who was talking about the same 5 or 6 years ago, when you say you first heard of it?

Ans. The conversation was with, in the first place, Nash & Danks, and John McBean and his sons, Archibald and another, whose name I forget, and other contractors, whom I don't now recollect.

142 x. Do you mean to swear that Nash & Danks, or John McBean, or either of them, mentioned to you, or advised you, of the existence of

the Austin patent or specifications before you had spoken of the same to them, or that you got information of its existence from them?

Ans. I mean to swear that I did not get, to my recollection, my first information from them. Who I did get it from I don't recollect. I had a good many conversations with them on the subject.

143 x. Did you not yourself communicate to them the fact of the existence of the patent referred to, and was not the first knowledge they had of it derived from you?

Ans. I don't know, sir.

144 x. When did you first see the specifications of said Austin's patent marked Ex. "G," or similar pamphlet, and by whom
685 were they first shown to you and when, as near as you can state?

Ans. I saw them in this city first, and they were shown to me by Mr. Burnham of this city. As near as I can recollect now it was from 2 to 3 years ago; it might have been longer. I think it was about the time the plea was made in the Greeley case.

154 x. Was the said Burnham of the firm of Burnham & Martin? Were said firm your att'ys in the Greeley suit?

Ans. They were.

146 x. Were the said specifications sent for by your counsel in pursuance of your request, or with your knowledge, and did you pay the expenses of procuring the same, or any part of said expenses?

Ans. I understood at the time that the city, by its att'y, and Mr. Martin, jointly agreed to send for the specifications to Mr. McCormick, who, it was understood, was in London at that time. I paid no portion of the expenses of procuring the specifications.

147 x. Was the suit of said Greeley referred to by you in your previous answers a suit for the am't of license fees agreed by you to be paid to said Greeley as the party then entitled to the patent fee of the Nicolson patent in Chicago for the paving of a portion of E. Lake st.?

Ans. The suit was for the am't he claimed as a patent fee for
686 paving E. Lake st. from the west line of Central av. to the east line of Wabash ave.

148 x. Was it or not for the balance remaining unpaid upon an agreement for license from him to you for the laying of the piece last referred to, and for which the specified am't of license fee to be paid by you per square yd. had been agreed upon between you?

(Objection. Objected to as incompetent and unnecessary to identify the suit.)

Ans. There was no balance due him. He claimed a patent fee in his suit, I think, of 16 c. p'r square yd.

149 x. Was not the suit based upon a license from Greely to you for the laying of the said piece of pavement, or a price for a license fee which had been agreed on between you, and which portion had been paid by you or by the city, and was not said suit to recover the am't of such license for which said Greeley claimed to be due?

Ans. I understood the suit to be based upon a license from Greeley to me and McClellan for the laying of said piece of pavement at a

price which had been agreed upon between us, of which no part of that particular piece referred to had been paid. Said suit was for the am't claimed by Greeley to be due.

687 *Re-direct.*

1 re-d. Your attention is called to your former testimony as to the area of the Austin pavement in the west wing of the intersection of Clark and Randolph. Do you recollect in substance what you stated on that subject in your examination in the beginning of last week, and do you wish now to make any correction or alteration in your testimony on that point? If so, what?

(Objection. Plaintiff's counsel objects to the witness making use of any facts which have been discovered or made known by examination of the said piece since his evidence was taken by which to correct the same.)

Ans. I recollect that I stated in substance in my examination. It was, I believe, that it was about 16 by 26 or 28 ft. that was paved by Austin pavement. I was present when that pavement, (the Austin pavement as it is called,) I saw it started, and gave direction to my foreman, Jas. Kenney, to pave that portion of the wing referred to laid with Austin pavement. This was some time in the afternoon. They paved a portion of it that afternoon, from ¼ to ½. My recollection of it now is that I was called away the next morning; gave particular instructions to fill it up with gravel, and then finish it off the next morning; and, to the best of my knowledge, it was so done. I was not present the whole of the time. I could not be.

688 2 re-d. Was there any, and if so, what, difference between the wooden pavement laid by you on East Lake st., S. Water, and West Lake st., as spoken of in your 4 and 5 cross ints., and Nicolson's 2d method of paving?

Ans. There was a slight difference. Those on East Lake st. and South Water were nailed every 3d, 4th, or 5th row of blocks, to keep the blocks at right angles with the street. In those on West Lake there are 2 nails in each picket or strip 4 feet long.

3 re-d. Which of Nicolson's so-called methods was adopted for the rest of the intersection of Clark and Randolph? What was the length of the strips or short blocks, and were they fastened, and how?

Ans. The length of the strips are 4 feet. The blocks are not laid at right angles with the street, but were laid to what we call a mitre or triangle. I believe it was according to Nicolson's 2d method. The strips or pickets were nailed; a nail put about every 2 feet apart.

4 r.-d In your suit with Mr. Greeley, referred to in your cross-examination, was not your principal defense the invalidity of Nicolson's patent of 1854? Was not Mr. Greeley represented by the present counsel for Mr. Nicolson in this suit, and did not both of these counsel argue Mr. Greeley's case with great length before the

judges of the Superior Court, and was not the opinion of the court in your favor?

(Objected. Objected to, the witness not being competent to
689 give evidence as to the opinion given by the court in said case, and if he were, such evidence being impertinent and irrelevant, and the other matters enquired of in respect to the counsel engaged being also irrelevant; and because the question assumes that the validity or invalidity of said Nicolson's patent was passed upon or decided by said court, a fact which has not been proved in the case.)

(Question withdrawn.)

5 re-d. Has the subject-matter of your suit with Mr. Greely, which was enquired of in the cross-examination, been settled or disposed of between you and Mr. Greeley? If so, when and how?

Ans. Yes, sir; it has been settled. De Golyer and McClellan received, as their books will show, about $535 00. I think the balance, after paying the lawyers $100 apiece, was divided between Mr. Greeley and ourselves.

6 re-d. Was there any particular selection of blocks or of planks, out of which the blocks were cut, for that Austin piece? Or were the blocks taken indiscriminately from the blocks cut for the whole intersection?

Ans. The blocks were taken indiscriminately from the pile laid at the corner of the street.

7 re-d. Is the width of the plank within a certain, and what limits, material for the manufacture of blocks for wooden pavements which you have constructed in Chicago?

690 Ans. It is material from 6 in. to 24 in. in width, between those widths it is not material.

8 re-d. The 85 to the 99 cross-int's inclusive; relate principally to the wearing away of the ship, or of the short block between one inch and three inches of the flooring; is your testimony on that subject, in answer to those int's, the result of your personal observation, or is it merely your opinion?

Ans. Well, it is more of a matter of opinion than of observation, in fact it is both.

9 re-d. State, if you please, what facts you have observed on that subject.

Ans. My observation, so far as it extends to Wells st., between S. Water and Lake, is that the wooden pavement goes much faster after the stone that the cells are filled with are all gone; after they are gone the pavement becomes an entire wooden pavement. The shortest I have had occasion to notice was about $1\frac{1}{2}$ or $1\frac{3}{4}$ inches; this was a year and a half ago, or two years ago; a portion of that is still standing, but it is all full of holes. This is between the north half and the south half, or partly in the north half and partly in the south, at the place where they were repairing some two years ago.

10 re-d. In constructing the Austin pavement as you made it, is the toe-nailing of the blocks sufficient or insufficient for all practical purposes of construction? If not, what is the difficulty?

691 Ans. I consider them sufficient for all practical purposes—toe-nailing of the blocks.

11 re-d. Which would hold the blocks in place during the construction of the pavement best, the Austin toe-nailed, as you made it, or the Nicholson 2d method with the strips merely inserted edgewise without being nailed.

(Objection. Pl'ffs counsel objects to the 10th and 11th int's, and to the answer to the 10th, for the reason that they are reopening the matters enquired of upon the direct examination, and not responsive to any matters called forth by the cross-examination.)

Ans. Well, I should think, according to my experience, a strip in there, although not nailed, would answer to keep the blocks in their places better than toe-nailing of the Austin pavement.

(Objection withdrawn. Objection to the last int. withdrawn.)

12 re-d. Suppose the strip were only $1\frac{1}{2}$ inches high, and merely inserted edgewise, without being nailed, would it, for purposes of practical construction, be any better than the Austin toe-nailing.

Ans. I should not think there would be any difference in it with the strip reduced to $1\frac{1}{2}$ inches in width.

13 re-d. Are or are not long and short blocks so combined as to form cells, whose bottom shall be a top of the short blocks,
692 especially described in Crannis's and Kemp's specification as one of the essential features of their combination?

(Objection. Objected to as being already inquired of by the direct examination, and almost in the same words.)

Ans. I so understand that they are.

14 re-d. Is or is not a support for the blocks, other than the prepared road-bed, or the interposition of some substance between the ground and the bottom of the blocks which will exclude or tend to prevent moisture being absorbed by the blocks from below, one of the elements and features described by Austin?

(Objection. Objected to for the same reason as the last.)

Ans. That's one of the essential elements to prevent decay in Austin's method.

15 re-d. Is it one of the principal defects in the Stead pavement, that he has no such support. (Withdrawn.)

16 re-d. Is there any objection to the Stead pavement in respect to the absence of any support or wooden foundation under the blocks? If so, state what it is.

Ans. In my opinion there are 2 objections; one is setting the blocks close together; the other is a deficiency in the foundation.

693 17 re-d. At the time of your conversation with Mr. Cleveland, referred to in the cross-examination, had you any suit pending against you by Mr. Greeley or by Mr. Nicolson in respect to this alledged patent right, and did you point out to Mr. Cleveland your objection to Mr. Nicolson's claim to such patent right?

Ans. Mr. Cleveland and I had several talks about patent rights; whether I pointed out the defects to him I am unable to say; those conversations might have taken place while the two suits were pending; I can't recollect.

D. L. DE GOLYER.

No. 1. C.

694 SEPT. 28.

E. Sylvester Chesbrough, being duly sworn, says:

1 int. What is your name, age, residence, and occupation?

Ans. E. S. Chesbrough; age 82; residence Chicago; occupation, civil engineer.

2 int. State how long you've been a civil engineer; in what places you have practised your profession; whether you are in the employ of the defendant as a civil engineer; and if so, how long have you been in such employ.

Ans. It's 37 years since I commenced civil engineering. I commenced both the study and practice of it at that time. I have practiced in Maryland, Pennsylvania, New Jersey, Massachusetts, New Hampshire, North and South Carolina, Tennessee, Kentucky, and Illinois. I have practiced in the city of Baltimore, Boston, Providence, and very near New York city, in Hoboken, Columbia, S. C., Lexington, Ky., and Chicago, Ill's. I am in the employ of the def't as civil engineer, and have been for 10 years.

3 int. Have you, as civil engineer, studied the art of road-making and road-paving.

Ans. I have paid no special attention to ordinary road-making and road-paving; of course I have studied the art. I was em-
695 ployed 17 years on railroads, but did not give ordinary road-making any special attention, or make it an especial study.

4 int. Have you examined the specifiation attached to letters patent issued to Samuel Nicholson, of date of Dec'r 1st, 1863, for a new and useful improvement in wooden pavement? and have you examined in said specification, the 2nd method of carrying out complainant's alleged invention, in which method strips of boards are used instead of short blocks?

Ans. Yes; I have.

5 int. Have you examined the specification of Henry Austin, No. "9,737," marked "G," in def'ts exhibit? and if so, state whether, in your opinion, a person of ordinary skill in the construction of wooden pavement, could, from such specifiations alone construct the pavement which Austin claimed as his invention.

Ans. I have examined it. The difficulty in my mind, in answering that question, is this: the specification covers several modes of making the pavement. If the question had read a pavement, I should have had no difficulty in answering yes.

6 int. Austin, in said specification, describes a pavement in which the blocks may be square or oblong, and the end laid together
696 without intervals or spaces between the ends; but forming parallel lines, and the intervals in the lengths only to be filled in as described in his specification, could a person of ordinary skill, in the construction of wooden pavements from Austin's specification alone, construct such a pavement?

Ans. I think he could.

7 int. What is the difference, if any, between a wooden pavement constructed in accordance with Austin's specification, of oblong or square blocks, and intervals between the blocks transverse to the direction of the roadway only, and the 2d method of practising Nicolson's alleged invention, as described in his specifications?

Ans. Austin, as I understand his specification, does not confine himself to filling the spaces with tar, or gravel and tar, that I understand to be included in the specification; that is, it may be used, or some other substance may be. Another difference, Austin does not mention a strip of wood between the rows of blocks, transversely with the line of the streets, though he does mention a fibrous substance, but I hardly think that means the strip of wood. Another difference might be, that in Nicolson's 2nd method they must be oblong blocks, while in this they may be square or oblong; I say oblong. They must be oblong, because that is requisite to make the Nicolson pavement of any advantage.

697 8 int. Do the differences which you state exist between the pavement described by Austin, and constructed as aforesaid, and a pavement constructed according with Nicolson's 2nd method, constitute a difference in the principle of the two pavements, or a difference in the mechanical construction?

Ans. I would say the difference between the two was in the construction.

9 int. Is there, in your opinion, any difference in principle?

Ans. I don't think there is, and yet I am not able to say how far the using a strip of board would constitute a difference in principle.

10 int. State whether, in your opinion, the use of strips of boards in the intervals between the blocks, as described by Nicolson in his 2d method, instead of a filling of concrete to the foundation or flooring, at all changes the principle of the pavement.

Ans. I have no other answer than I gave to the previous question. I am unable to see the difference.

11 int. When you use the word difference, in answer to the last int., do you mean a difference between the question, or a difference in the principle of the pavements?

698 Ans. I meant I could see no difference to the principle involved in the question. The questions amount to the same.

12 int. Are you unable to give an opinion as to whether there is a difference in principle between the tar pavements constructed as aforesaid? If not unable, give your opinion.

(Plaintiff's counsel objects to this question as repeating a question before asked and answered by the witness in 9, 10th, and 11th direct int's.)

Ans. I don't feel certain that I know what constitutes a difference of principle of patent, but my opinion is there is no difference in principle of the pavements last described.

13 int. Suppose a pavement constructed in accordance with Austin's specifications, the blocks being laid as aforesaid, with the exception that the blocks, instead of being glued or cemented to the floor or foundation, were toe-nailed, would this be a change in the principle of the Austin pavement, or in construction only?

Ans. If you mean by the question, that in the case of the Austin pavement the space is to be filled with tar and gravel, which in the Nicholson pavement would be filled with a strip of wood, I see no difference in principle.

14 int. Would toe-nailing the blocks to the foundation or
699 flooring, instead of glueing or cementing them to the foundation, as described in Austin's specification, constitute a change in the principle of the Austin pavement?

Ans. I think it would be only a change of construction and not of principle.

15 int. Suppose two pavements constructed equally well and of light materials, the one in accordance with Austin's specifications, the intervals between the parallel rows of blocks being in one direction only, viz., transverse to the direction of the roadway, and the other constructed in accordance with Nicolson's 2d method of practising his alleged invention, would there be any substantial difference between such pavements in the superficial appearance, or uniformity of surface, or freedom from slipperiness, or comparative noiselessness, or cleanliness, or durability, or usefulness for the usual and practical purposes of a pavement, or in any of these; and if so, in which, and what difference?

Ans. I can see no substantial difference.

E. S. CHESBROUGH.

700 OCT. 13.

Francis C. Treadwell, jr., being duly sworn, doth depose and say:

1 int. What is your name, age, residence, and occupation?

Ans. My name is Francis C. Treadwell, jr. I am 42 years of age. I reside in the city of New York. I am solicitor of patents and consulting engineer.

2 int. What have been your opportunities, if any, for acquiring information in matters of mechanical construction and invention?

Ans. I have for many years past been in the habit of examining inventions of various kinds, and preparing specifications for letters patent thereof; also, in examining various mechanical constructions, the subject of patent suits, and investigating the state of the art involved in such controversies, and in testifying as expert in patent causes in the United States courts. I have had occasion, in the course of my business as consulting engineer, to examine the subject of wood, iron, and stone pavements, and am well acquainted with various modes of paving with those materials practised in the city of New York for the last 20 years.

3 int. Have you examined the several specifications annexed to the original letters and the revised letters patent of the com-
701 plainant, relating to wooden pavement, and do you understand the construction of such pavements upon the several methods therein stated or referred to?

Ans. I have examined certified copies of the several original and

reissued letters patent, and believe I do understand the construction as described therein.

4 int. Will you please to examine the def't's Ex. "B," which purports to be a specification of David Stead, and state whether the pavement therein described is substantially like, or substantially different from, the pavement described in comp's reissue, and give your reasons fully for your opinion?

Ans. I have examined def't's Ex. "B," which is a printed official copy of the English letters patent granted to David Stead, Ap'l 23, 1839. There are several forms of pavement described in said specifications, and among them is a form, shown in Figs. 21 and 22, of the first sheet in the drawings, and referred to on page 4 of the specifications, which I consider to be substantially the same pavement as described in said Nicolson's reissue. This form of paving consists in wooden blocks, having channels between them, containing cement for a filling. The channels are formed by having portions of the blocks extending from the base upwards, to a distance considerably short of the top of the block, project from the perpendicular of the sides of the upper portion of the blocks, so that when the blocks are joined together, there are cells suitable to contain the fill-
702 ing of cement. In the beginning of this specification of Stead's, it is stated that the foundation is first suitably prepared to the required figure, by the usually well-known means. One of the usual well-known means of preparing the foundation for pavements, is to ram the earth and apply a layer of Roman cement and stones and gravel, commonly known as hydralic concrete. This has been known since the days of the old Roman pavements. Now, I am aware that the specification of the comp't describes channels which are made by short blocks, separate from the long blocks, but I consider the shorter portion of the blocks in Stead's specifiations a full equivalent for that mode of constructing channels, and in fact presents an advantage in respect that there are fewer cracks or joints in the pavement. I am also aware that is one of the forms described in the said comp'ts patent. The short blocks consist of long narrow strips of wood, instead of being of the width of the long blocks, but they are classed in the said Nicolson reissue and the original patent as equivalent for the short blocks of the same diameter as the longer block in the other forms described in the said specifications. I am also aware that in one part of the said comp'ts reissue the fillings of the cells are described to be of tar and gravel, or stones; but in another part it is stated that, "instead of the broken stone and tar, any other suitable cementing materials, or cement, may be employed in the cells," by which I understand that the construction described in said patent is not intended to be
703 limited to broken stone and tar, but that any suitable cementing material, which may contain neither broken stone nor tar, would be within the invention specified, the object being to prevent the water from passing down through the pavement, and to afford a foothold for horses not so slippery as wood. I am also aware that various means are described in said Nicolson specifications for pre-

paring the road-bed or foundation for the pavement, such as laying upon the earth, after it is suitably graded, tarred paper or lime mortar or hydraulic cement; also, that a cheap flooring of boards may be laid upon the earth as a foundation for the pavement, and there is a farther suggestion that this cheap flooring of boards may be covered with tar or any other preventive against moisture.

Many of these described modes of preparing foundation are by no means equivalent to each other, and some of them will not prevent moisture from penetrating through them and attacking the bottom of the pavements, as for instance, a cheap flooring of boards will not do this, neither will lime mortar, which will become soon rotted and destroyed by the action of water; and I think tarred paper, although it might tend to keep out water as long as it preserved its integrity would soon be destroyed, cracked sufficiently to [to] admit any quantity of water to the bottom of the pavement, especially if laid, as described in the specification, upon earth graded in
704 the usual manner. Therefore, if the construction described in the said Nicolson patent is or is not to be limited to any one of the various forms of foundation described in the said reissue or their equivalents, namely, forms of foundation which will or will not admit moisture, I find such form sufficiently included in the general description of Stead's patent, because foundations existed, and were well known prior to that date, that would exclude moisture, as in the case of the Roman or hydraulic concrete foundation; and also those which would not exclude moisture, as in the case of the common gravel and rammed broken stone foundation and cemented, commonly used in road-making. Some of the kinds of foundation described in said Nicolson reissue, which will exclude moisture or tend thereto, are by no means, in my judgment, equivalent to each other; for instance, the tarred paper is not a mechanical equivalent for a tarred floor of boards; it will not support a block pavement evenly when placed upon a commonly graded road, and one of the objects set forth in the specifications will therefore not be obtained, namely, durability and provision against unequal wear, which would arise from the sinking of some of the blocks; a cheap floor of boards, whether tarred or not, is in no sense a mechanical equivalent for a layer of either lime mortar, or hydraulic cement, or of tar and sand, the materials being substantially different and its mode of application being substantially different. I observe that it is stated in said reissue that the short blocks are used
705 to form bottoms to the cells, and to prevent the gravel from working under the bottom of the long blocks. The projecting short sides of the blocks in Stead's English patent would perform such offices if it were necessary to be performed in the case of tar and gravel, which necessity I very much doubt, and do not believe it does occur; but I do not understand, as I have before stated, that the construction described in the said reissue is limited to cells of tar and gravel composition; but, on the contrary, I understand the specification, in express terms, to state that cement may be employed as a filling for the cells, in which case there would be no broken stone or gravel to get under the blocks; therefore, the difficulty would not

arise, which it is stated the short blocks are used to prevent, and the short blocks or strips would merely serve the purpose of filling.

5 int. Do you find in the specifications of Nicolson's original patent any suggestion for tarring the board flooring? if so, please refer to it.

(Objection. Objected to as irrelevant and improper.)

Ans. I do not find in the original patent any suggestion of a tarred floor. The suggestion of tarring the floor occurs in the reissue.

6 int. In constructing a pavement upon Nicolson's original
706 patent with a board flooring, would it be necessary to tar the floor?

(Objected to as irrelevant and improper.)

Ans. If I were to follow the directions of the specifications when constructing the pavement with a floor, I should make a floor of cheap boards over the road. I should not tar it unless I wanted it to keep out water; and if I did tar it, it would be for my own idea, and not from the directions of the specifications, which says nothing about tarring the floor.

7 int. Will you please to examine the model now shown you, and marked "Ex. No. 1," to this your deposition, and state whether it does or does not represent substantially the forms of the blocks in the Stead's patent, to which you have referred to, and the mode in which they stand together?

Ans. I have examined said ex.; it does not substantially represent the form of the blocks shown in figs. No. 21 and 22, in the Stead's patent, and the manner in which they stand together in the pavement. I observe that the blocks in this model are not so long in proportion to their face as they are represented in the figs. in the patent, which makes the model not so advantageous a representation that it would be if the blocks were longer, because it would then show
707 a smaller area of the face or wearing portion of the blocks in proportion to its depth. The proportion of the projecting surface to the wide blocks is about the same in the model as in the drawings of the patent.

OCT. 14.

8 int. Would the arrangement of blocks in a pavement, constructed so as to be within Stead's method, and one so as to be within Nicolson's method, be limited to any particular width or depth of cells? if not, how nearly may the dimensions of cells in a pavement constructed on Stead's method approach to the dimensions of the cells constructed according to Nicolson's method?

Ans. I do not consider that in either the Nicolson's reissue or the Stead patent that the dimensions of the cells are limited to any particular proportioned width or depth. In the Nicolson reissue the short blocks are described as being about half the length of the long blocks, and in Stead's patent the drawing shows that the projections are a little more than half of the length of the sides of the blocks. But the description does not specify any relative proportion of the projecting side to the length of the block. The language being general, and conveying to my mind that channels of sufficient depth to

contain cement filling and preserve it, are what is intended to be constructed if the cells in both the Stead's and Nicolson's pave-
708 ment were of the same dimension, they would be within the description of either patent, provided they were sufficiently deep to contain and hold the cement filling properly.

9 int. In your comparison of the Nicolson and Stead pavements, did you take into consideration that in Stead's method the filling leaves a slight space between the top of it and the top of the blocks?

(Withdrawn.)

9 int. Is there any, and if so, what substantial difference between the construction of a pavement, according to Stead's method, and the construction of a pavement, according to Nicolson's method, with reference to the nearness of the filling to the top surface? if so, what is your opinion as to the effect of such difference?

Ans. There is a very slight difference, which I do not regard as substantial. The Stead's specification states that the channels may be filled up with cement, so as to leave a slight space unfilled beneath the top surface to afford a hold to the horses feet; and the Nicolson specification directs the channels to be filled up, but, in practice, it comes to the same thing, whether the channels are filled entirely or a slight space left unfilled, because the filling is soon compacted by the street dirt, so as to drive it a slight distance below the top surface of the pavement, or below its original surface, in either case, as may be seen by observing the so-called Nicolson pavement in the streets of Chicago.

709 10 int. Please to examine def'ts Ex. "C," which purports to be the specifications of Thos. Wood, the younger, No. 8,657, and state whether a pavement constructed upon that method would be to any, and what, extent substantially the same as, or substantially different from, a pavement constructed upon the method of Nicolson's reissue. Please to give your opinion fully, and your reasons therefor.

Ans. It have examined said def'ts Ex. C, which is printed official copy of said Wood's English specification, and am of the opinion that there is described therein a pavement substantially the same as that described in the Nicolson reissue. In the Wood's specification I find a description of a pavement made of long and short blocks of wood so disposed as to leave cells or channels, which may be three inches deep, more or less, and these cells or channels are to be filled with concrete or coal tar, asphalte, or other bituminous substance, heated and mixed with gravel, sand, or such like material. So far, the description is of a pavement identical with that of the Nicolson. I am aware that the blocks, as described in Wood's specification, have inclined more, and that is the description part of the Nicolson specification, the blocks are described as having parallel sides. But I do not consider the construction described in said Nicolson's reissue to be limited to blocks with parallel sides, but only to long and short blocks so disposed as to form cells. In the Wood specification there is no especial direction respecting the material or mode of construct-
710 ing the foundation, but the language of the specification is such

as to convey to my mind that the pavement is to be placed on any known foundation suitable for pavements. The patentee states that the shape of his blocks gives the pavement complete firmness and solidity, even when put down on a foundation of mere shingle, gravel, or sand, from which I infer that the patentee did not direct the pavement to be put upon that kind of foundation exclusively. Now, in carrying out the specifications of Wood practically in making a pavement, the blocks would not be so well fitted as to form impervious joints, even although they were wedged tight together, owing to the necessary uneveness of the surfaces of such work when constructed with reference to reasonable economy; and if the hot bituminous substances were poured into the cells as directed in the patent, a portion of it would flow down through the joints to the bottom of the pavement, and would flow into the foundation of shingles under the blocks of the pavement if the blocks were laid upon such foundation, thus forming a concrete of bituminous substance and shingle, which would, to a greater or less extent, protect the bottom of the blocks from water. The short blocks in the Wood pavement would perform all the functions of the short blocks of the Nicolson pavement. As I have before stated in my answer respecting the "Stead's" specification, the different foundations or preparations of the road described in the Nicolson specification as equivalent in the
711 structure, do not all exclude water, and differ so much from each other as not to be mechanical equivalents for each other; and therefore it is impossible for me to select from them the precise kind of foundation or material or substance or equivalent therefore to be used in the foundation to which the construction is limited by the Nicolson specification. And my difficulty is increased by the language of the summing up of the specification, which states that the component part of the combination specified is "substantially as herein described." In order that I may be understood I quote the first part of the summing up, "The so combining or arranging the foundation or support (or its equivalent) of said wooden pavement resting on the roadway surface or bed, substantially as herein described." These words, "substantially as herein described," refer me back to the description of the kinds of foundation or materials to be used, some of which will, and some of which will not, exclude moisture from the bottom of the pavement. But whether this structure, described in the Nicolson reissue, be limited to any one of the kinds of foundation or preparation of foundation, or its equivalent, or extended so as to include so a component part of the combination anything that will do for a foundation, so long as it excludes moisture, or whether it excludes moisture or not, is not material, in my judgment, in the comparison of the Wood structure and the Nicol-
712 son reissue, because, as I have before stated, I infer from the specification of Wood, that this pavement may be laid upon any foundation suitable for laying pavements upon; and I do not regard the arbitrary selection of any well-known means of supporting or sustaining a pavement, and applying it to some especial form of pavement, to which it contributes the same kind of support and pro-

tection as to other pavements, as creating any difference which can mechanically be regarded as a substantial difference in the combination. The word shingle in the Wood specifications, as I understand it, refer to the ordinary beach gravel and sand as found on the shore.

11th int. Please to examine defendant's Exhibit "E," which purports to be an official copy of the specification of solid paving, number 9,410, and state whether a pavement constructed on that method would be in whole, or in any and what substantial part, substantially the same or substantially different from a pavement constructed on any or either and which of the methods of Nicholson's reissue; give your opinion fully, and your reasons therefor.

Ans. So far as the pavement is concerned, and its foundation as described in Perring's specification, it is substantially the same as the pavement, and one of the kinds of foundation described in the Nicolson reissue; it consists of blocks of wood, so disposed as to form cells
713 or channels between them, which may be placed, according to the statements of the specifications, upon a concrete foundation; when the travel is considerable the channels between the blocks are partly filled by strips of wood, or other elastic substance, placed between the blocks at the bottom of the channels. The blocks of wood are pinned together, and the strips are pinned to the blocks by wooden pins or pegs. There is no direction in the Perring specifications to fill the channels of the surface of the pavement with concrete of tar and gravel, or with cement. But I observed at the end of the specification, (invention described includes the use of elastic substances, placed between blocks of whatever shape, for the purpose of affording a secure foothold.) I do not consider the Perring specifications to be limited to any precise depth of channel, the object of having the channels being stated to be to afford a secure foothold for horses. Now, if a piece of India rubber or cork, or other elastic material, were placed between these blocks in the manner described in the specification, so as to make a tight joint, it would not only prevent stone or gravel from getting down under the blocks, if there should be any tendency of that kind, but would also prevent moisture from going below the top of the elastic filling, and in such case would be a full equivalent for the strips of wood in the Nicolson second form, and also for the filling of gravel and tar or cement, as far as it extended on the side of the block. I should not consider the
714 Nicolson structure essentially changed if the tar or cement filling of the cells did not extend entirely up to the top of the block, or if it fell short an inch, or even more; so long as there was a tar or cement filling in the cells which would prevent or tend to prevent moisture working down below, it would, in my judgment, be within the structure described in the Nicolson patent. Otherwise, the Nicolson structure would cease to be the structure described in the patent, if some one were to remove a portion of the filling of the cells, or it should be driven down in the cell, and have a layer of stout dirt packed upon it by the travel of the road. If the structure described in the Nicolson specification be not limited to any particular substance, or its equivalent, for the filling of the cell, but is broad

enough to include anything that will do to keep moisture or wet from going down into the pavement, I consider that the Perring pavement is substantially the same in all respects. The Nicolson specification states that any suitable cement may be used for the filling; there are cements impervious to water, which are also elastic, being formed in part of India rubber, and are used in the arts both to cement materials together, to keep out water, and for the purpose of elasticity. These kind of cements would come within the definition of any suitable cement that would keep out water of the Nicolson patent, and also within the definition of elastic substances in the Perring
715 patent. But they would have to be put in in the liquid form in the construction of [of] both pavements; but when put in and solidified would present substantially the form shown in both patents, as the form of the complete structures.

12th int. Please to examine defendents Exhibit "F," which purports to be an official copy of the specifications of Crannis and Kemp's patent, in relation to wooden pavement, and state whether a pavement constructed on any, or either or which, of the methods therein described, would be in whole, or in any, and in what substantial part or parts, substantially the same or substantially different from a pavement constructed on, or either or which, of the methods in Nicolson's reissue; give your opinion fully, and your reasons therefor.

Ans. I find described in the said Crannis and Kemp's specification a pavement of long and short blocks of wood, so disposed as to form cells or channels between the long blocks, and a foundation of boards or plank, which may be constructed, more or less cheaply in proportion to the goodness or strength of the materials. Various forms of this pavement are shown in the specifications and drawings. In some of the forms the channels are made by cutting them in the blocks themselves, or cutting away portions of the sides of the blocks; but in others, the long and short blocks are separate pieces. The
716 figures from 60 to 75 show various forms of these blocks. I do not observe any statement that the cells are to be filled with any materials, or that any water-proofing materials is used to prevent water from getting down into the pavement, and therefore I do not consider that the Crannis and Kemp specification show all the features of the construction described in Nicolson; but it does show the pavement described in the Nicolson reissue upon a board floor, and in that respect it is equivalent to both of the forms described in the Nicolson patent, leaving out the filling of the cells, of other material than wood.

13th int. Please examine defendants Exhibit "G," which purports to be an official copy of the specification number 9,737, of Henry Austin, in relation to wood paving; state whether pavement constructed upon any or either and which of the methods therein described, would be substantially the same as or substantially different from a pavement constructed upon either, and which, of the methods in Nicolson's reissue; state your opinion fully, and your reasons therefor.

Ans. I find in the said Austin's specifications a pavement of wooden

blocks described, so disposed upon a foundation of wood or of cement as to form cells or channels, which channels are to be filled with broken stone, refuse or broken slate, grit, gravel, sand, or any hard or any fibrous substances, and this filling in is to be cemented with
717 liquid lime or cement poured in, or with pitch or lac and India rubber dissolved in naptha melted, and poured in. The specification does not state in precise terms that the cells may be filled or partly filled with short blocks or strips of wood; but short blocks or strips of wood would come under the denomination of hard or fibrous substance; so would oakum, which is a common practice to use for the purpose of packing joints; hemp or manilla, in the form of rope or junk, or in a loose form, would also be included. If the filling were composed of pieces of wood or of oakum, or other fibrous substances, and a cement of India rubber were poured in, the structure would be equivalent to the structure described in the Nicolson patent as respects the formation of the cells and their filling; and all the functions of the cells, filling, and the structure forming the cells would be performed, even to keeping out gravel from getting under the bottom of the blocks, should there be any tendency for it to go there. The foundation in the first part of the specification is described to be of plank or slabs or pieces of wood, of convenient size and thickness, and that it may be cemented together; and on the bottom of the fourth page of the specification and the top of the fifth page, it is stated that the wood for wood pavements described in the specification may have a cement foundation. Upon referring more particularly to the specifications, I perceive that the words I
718 referred to on the bottom of the fourth and the commencement of the fifth page refer to the cementing of wood unto cement flooring, and other building purposes, and not especially to wood pavements; and I therefore was mistaken in stating in the first part of my answer that a cement foundation for wood pavements for roads was described; but there is described, as I have stated, the flooring of wood cemented together, and it is also stated that the blocks of wood forming the pavement are to be cemented to the wood foundations by cement, composed of in part India rubber, or any other cement or glue, sufficiently strong, and not so affected by heat or moisture as to injure the joints.

This mode of construction is in effect the same as if the board flooring were covered with water-proof cement, and the blocks applied to it; because the bottoms of the blocks are protected by the water-proof cement, which secures them to the floor, and the bottoms of the cells by the liquid water-proof cement poured into them, and the floor itself being cemented together, a much more efficient protection from moisture is afforded than would be by the use of tar paper, lime mortar, or a cheap flooring of boards, as in the Nicolson reissue. I am aware that the blocks are secured to the foundation in compartments in the Austin patents, and that in the Nicolson patent the flooring is not especially described as in compartments or sections; but I do not consider that a material difference, because I do
719 not consider the Nicolson specification limited to any particu-

lar style of flooring or foundation, and the Austin specification states that the compartments should fit each other, and be glued, nailed, or screwed, or otherwise fastened on to separate pieces of timber laid underneath, and that they may be tied down by iron ties or by any convenient mode. The flooring of these compartments would, when constructed in such manner and laid in the street, be a complete flooring, but would have the additional advantage due to its construction, of being taken up in sections for the purpose of repairs of the pavement, or the laying and repairing of pipes and sewers underneath. Taken as a whole, I consider the pavement described in the Austin specification as containing all the essential features described in the Nicolson specification, even if the pavement in the Nicolson specification be limited to materials for the filling of the cells and foundation, which will protect, or tend to protect, the pavement from moisture, and to a mode of construction of cells, which would prevent gravel from working down under the blocks. There is also a statement in the Austin patent that the foundation may be of stone, slate, or iron, instead of wood, and that the blocks in such case are to be cemented to such foundation in like manner as on to the wood foundation. This would be a more expensive kind
720 of construction, but the stone and iron would more effectually keep out moisture from the bottom of the block pavement and filling. It would not change, substantially, the general character of the structure as a pavement, although the combination of materials would be different, and the one might be an improvement on the other.

14th int. Please to examine the model produced and marked exhibit number two, of this your deposition, and explain what, if anything, it represents.

Ans. It represents the form and position of blocks with channels between them, as described in the Austin specification, and the order in which they stand upon the flooring. But the blocks are not connected to the flooring by the means described in the Austin specification, being connected to the flooring in the model by nails, and in the Austin patent by water-proof cement. The floor in this model appears to have been made in one piece, and not of pieces cemented together as in the Austin patent, and there is no filling of fibrous or other substances, and water-proof cement, as in the Austin patent.

15th int. Will you please to examine the specimen of pavement produced and marked J. K. Thompson, A, and state whether, and if so, what part of it is substantially within or substantially
721 without the method of the Austin patent.

Ans. I can't make a complete examination of this pavement without taking off the strips nailed on it at the end, which do not appear to have constituted any portion of the pavement, and having requested permission to remove them for the purpose of making examination, and not being allowed to remove them, it is impossible for me to give a very complete and definite answer to the question; but so far as I am able to examine the pavement, the whole, it seems to me, to be substantially within the Austin description, so far as respects

the flooring and blocks and their position on the flooring, and the flooring appears to have been cemented to some substance underneath by some kind of water-proof cement or substance, to prevent water coming through its cracks; whether the blocks are cemented to the flooring by any water-proof composition, I do not know; some of them appear to be confined by nails to the flooring, and under one of them there appears to be remains of some bituminous substance, which has been used to cement the blocks to the board or exclude moisture from it. So far as the blocks are confined to the flooring by nails, it differs from the description of the Austin patent. The filling appears to be of some hard substance, such as wood, gravel,
722 sand, cemented together by some kind of cementing material, remains of which, at the place where I can gain access to it, smell like tar, pitch, or some bituminous matter. I do not know nor cannot determine, from the section of pavement in the condition it now is, with strips of board nailed on its side, whether there are pieces of wood in all the cells between the blocks; but is not material, as in my view the Austin specification includes in the description all kinds of hard, elastic, or fibrous substances, as well as other than gravel and sand and any kind of water-proof cement which will not be affected by heat or moisture, so far as to injure the joints. Taking the pavement as a whole, I consider it within the Austin description—that is, assuming that there is water-proof adhesive material between the blocks and board flooring and such filling, as I have before stated in this answer, as described in the Austin patent.

16th int. Can you state whether or not the foundation of concrete or of asphalt was known as a foundation for wooden block pavement prior to 1847? and if it was, state whether, in your judgment, there would or would not be any invention, and whether substantial or otherwise, and how, in its subsequent application to any particular kind of wooden block pavement.

(Objection to the above question as irrelevant and improper.)

723 Ans. A concrete foundation for wood pavement brought to a smooth or level surface, either by a fine concrete or a thin layer of asphalt, is described in the English letters patent to William Grimman, dated April 15th, 1840, and marked defendant's Exhibit "A," in this case. I recollect of seeing wood pavements laid in New York, upon a foundation of boards covered with tar; but that was not a concrete foundation, and perhaps does not come within the scope of the question, and I am not certain that it was before 1847. The wood pavement in Grimman's patent is of blocks of wood, having the channels cut on the surface or side, to afford a foothold for horses, and they are to be laid upon this concrete foundation covered by fine concrete or asphalt. In my opinion there would be no invention in laying a wood pavement having deeper channels or no channels, or otherwise differing in form and substance in the structure of the top of the pavement from Grimman's pavement upon Grimman's foundation, any more than painting some house constructed in a different style of architecture from some other house that had

been painted with the same kind of paint. It is true that in such a case there would be a combination of the paint used with a different style of house, or a house constructed for different purposes, such as a church, dwelling-house, barn, or out-house; and one would
724 not say that the whole of each structure, including the paint for its protection from the weather, was not different as a combination of materials, and condition and form of material, from either of the others; but so far as the difference existed between the structures, it would not be in the mere application of a well-known means of protecting the outside of the structure from weather.

(Objection. Counsel for complainant objects to the whole of the foregoing answer as irrelevant and improper in this case.)

17th int. Are you acquainted with the practice in the Patent Office, as to the receipt and filing of applications for patents and of caveats?

(Objection as irrelevant and improper.)

Ans. I am.

18th int. State, if you please, whether caveats and applications for patents can be contained in one and the same instrument, so as to be consistent with the practice of the Patent Office; if so, why not?

(Objection; same reason, irrelevant and improper.)

Ans. They cannot, and are not. A caveat, when filed in the Patent Office, is filed in the secret archives of the office and kept with the other caveats in the secret archives, under the charge of
725 sworn officer of the Patent Office; and no one is allowed access to them, either during the year for which they run or afterwards, except the examiner of the Patent Office, whose duty it is to examine the caveats for the purpose of being able to give notice to the caveator of a subsequent application filed within the year. And also the party filing the caveat, or any one having a power of attorney from him, may be allowed to examine the caveat and preserve a copy; and this is the case even after application has been made by the inventor for a patent. I know this, because in my practice as solicitor of patents before the Patent Office, I have several times requested the proper officers of the Patent Office to show me the caveat which preceeded the application for a patent, when the entry upon the filed wrapper of the application showed that a caveat had been filed, and that under the law which existed before 1861, the twenty dollar caveat fee had been appropriated and used as a part of the application fee, and had always been refused on the ground that caveats were secret and confidential, and not matters of public enquiry and investigation. It has always been the rule and practice of the Patent Office to consider the caveat as entirely separate and distinct record from the application. The file wrapper is sometimes marked "applied," to denote that an application had been made for a patent by the caveator; but none of the papers constituting the caveat, (that is, petition, description and oath,) are regarded,
726 or received, or used as any part of the application for a patent. On the contrary, the Patent Office, in accordance with the act of 1863, requires a new petition, specification, oath, two drawings,

and a model to be filed, and the balance of fee, (if under the old law,) or (if under the new law) a new fee to be paid before the application is filed; and if any one of these prerequisites are not complied with, the other parts of the application are merely considered as received at the Patent Office, awaiting the final completion of the application. When the application is finally completed, the petition, specification, and oath, and any correspondence that may come with it, or ensue, is placed in an application file wrapper, under the charge of a different officer from the caveat clerk. The drawings are placed in the custody of the draughtsman of the Patent Office, and the model in the custody of the machinist, subject to the call of tho examiner, for the purpose of examining the application. When the application is granted, the papers which were in the file wrapper, including any amendments to the application, with the file wrapper, are transferred to the custody of another officer, and kept by him in the room separate from the room in which the caveats are kept, subject to the examination of the public, as the file wrapper of the application has no reference to the caveat, except to show a caveat was filed when the application comes under the old law requiring the transfer of the caveat fee as a part of the application fee. The file wrapper
727 of an application also shows when the different papers constituting the application and the model and application fee were received, the name of the examiner, the fact that the patent was ordered to issue, the name of the attorney of any of the applicants, and there are sometimes mamorandums made upon it of the return of the specifications and drawings to the applicant and his attorney, when returned for amendment.

(The complainants object to the foregoing answer that a lecture or treatise on the practice of the Patent Office is not called for by the question, and is impertinent and irrelevant to the matters at issue.)

19th int. Have you examined the certified copy of the file wrapper annexed to the deposition of Samuel Nicolson, in this case? If so, state whether it is the file wrapper of an original application for a patent, or whether it is a file wrapper of a caveat merely.

(Objected to for the reason that the document speaks for itself, and it is not competent for any witness to interpret it or attempt to change or explain its terms)

Ans. I have examined such certified copy of file wrapper. It is, as the certificate of the commissioner states, a caveat file
728 wrapper copy, and not an application file wrapper copy. Of course, I have no means of knowing if it is a correct copy.

F. C. TREADWELL, JR.

Closed on the 14th.

729 UNITED STATES, *Northern District of Illinois, ss:*

I, Philip A. Hoyne, a commissioner appointed by the Circuit Court of the United States, and for the northern district of Illinois, in the eighth circuit, under and by virtue of the act of Congress, do hereby certify that the reason for taking the foregoing deposition and the fact is, that the same was taken by agreement of parties.

I further certify notification of the time and place of taking said deposition was made out.

I further certify that on the twenty-first day of September, A. D. 1866, I was attended by Goodwin, Larned & Goodwin, of counsel with the said plaintiff, and by Edward Martin and Francis Adams, of counsel with the said defendant, and by the witnesses, who were of sound mind and lawful age; and the witness having been by me carefully examined and cautioned, and sworn to testify the whole truth, the depositions were by me reduced to writing in the presence of witnesses, who subscribed the same in my presence, and I have retained the said deposition in my position, for the purpose of transmitting the same by hand to the court for which the same was taken. I further certify that I am not of counsel or attorney for either of the parties in the said deposition and caption named, or in any way interested in the event of the said cause.

In testimony whereof I have subscribed my name and affixed my seal, this 21st day of February, A. D. 1866.

[SEAL.] PHILIP A. HOYNE,

U. S. Commissioner Northern District of Illinois.

[5-cent stamp.]

730 The United States Patent Office to all persons to whom these presents shall come, greeting:

This is to certify that the annexed is a true copy from the files of this office of the file wrapper and contents, and drawing in, i. e., the letters patent granted Sam'l Nicholson, reissued Dec'r 1st, 1863, No. 1,583.

In testimony whereof, I, S. C. Theaker, Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed this twenty-eighth day of December, in the year of our Lord one thousand eight hundred and sixty-five, and of the independence of the United States the ninetieth.

[SEAL OF THE PATENT OFFICE.] T. C. THEAKER.

731 TO THE COMMISSIONER OF PATENTS:

The petition of Samuel Nicolson, of Boston, in the State of Massachusetts, respectfully represents that he did obtain letters patent of the United States for a new and useful improved wooden pavement, which letters patent are dated on the eighth day of August, in the year eighteen hundred and fifty-four; that he is advised by counsel learned in the law, and now believes that the said letters patent are inoperative or invalid by reason of a defective specification, which defect has arisen from inadvertence and mistake. He therefore prays that he may be allowed to surrender the said letters patents, and requests that new letters patent may issue to him for the same invention for the residue of the period for which the original patent was granted under the amended specification herewith presented, he having paid thirty dollars into the treasury of the United States, agreably to the requirements of the act of Congress in such case made and provided.

SAMUEL NICOLSON.

732 STATE OF ILLINOIS, *Cook county, City of Chicago, ss:*

On this fifth day of November, A. D. 1863, before the subscriber, Daniel Goodwin, jr., a notary public in and for the city of Chicago, in the county and State aforesaid, personally appeared the above-named Samuel Nicholson, and made solemn oath that he verily believes that by reason of an insufficient or defective specification his aforesaid patent is not fully valid and available to him; and that the said error has arisen from inadvertence, accident, or mistake, and without any fraudulent or deceptive intention, to the best of his knowledge and belief.

DANIEL GOODWIN, JR.,
Notary Public.

733 The original specification of Samuel Nicolson, in the description of the subject-matter of invention, covers far more than does the claim, which latter I was advised did substantially cover the whole of my invention, when the application for a patent was originally made. The object of this invention was to make a perfect roadway or pavement, free from the many defects of those previously constructed; and to do this it is necessary, and is so described in the specification of my patent, that the foundation of my superstructure should be made in the peculiar manner described to wit: So preparing the grade of the street or road by giving to it the proper curvatures, covering its surface with tarred paper, wooden flooring, or other equivalent devices, to prevent moisture penetrating the lower ends of the wooden blocks or pavement. It is this construction of the bed, with this superstructure or pavement, that I consider and believe to be the subject-matter of my invention, and the combination of the bed or foundation with my peculiarly constructed pavement is what I desire to claim on my original patent, and what until recently I supposed was covered by said claim. It is this inadvertency and mistake in the original patent that I now desire to remedy and correct in this my application for a reissue
734 of my original letters patent.

SAMUEL NICOLSON.

To Hon. D. P. HOLLOWAY,
Comm'r of Patents, Washington, D. C.

Endorsed: Rec'd and filed Nov. 18, '62. E. E.

To all whom it may concern:

Be it known that the following is a full, clear, and exact description of the new and useful improved wooden pavement invented by me, Samuel Nicolson, of Boston, in the State of Massachusetts, and for which letters patent were granted me on the eighth day of August, in the year of our Lord one thousand eight hundred and fifty-four, the said letters patent having been surrendered for the purpose of describing the same invention, and pointing out in what it consists, in more clear, full, and exact terms than was done in the original specifications.

The nature and object of my invention is the creation and constructing of such a wooden pavement for streets and roadways
735 as shall be comparatively permanent and durable, by so uniting and combining all its parts, both superstructure and foundation, so as to provide against the slipping of the horses' feet, against noise, against unequal wear, and against rot on and from the top surface, and against rot and consequent sinking away from below or the working of the gravel or other material under the blocks so as to cause inequalities in the surface.

For a clear understanding of the manner of constructing my improved wooden pavement, I refer to the accompanying drawings, with corresponding letters of reference, making part of these specifications, of which drawing No. I, figure 1, represents a top view of the first plan of said pavement, and figure 2 of the same drawing represents a traverse and vertical section of the same; and figure 1, of drawing No. II, represents a perspective view of the said pavement constructed after the second plan or modification; and figure 2, drawing No. II, a further perspective view of the said pavement on the first plan; and figure 3, drawing No. II, a further perspective view of the said pavement on the second plan.

(Here follow drawings marked page 735, No. 1, and page 735, No. 2.)

The earth of a roadway, upon which my improved wooden pave-
ment is to be constructed, must first be suitably graded in any
736 of the usual and well known methods, in order to prepare it for the reception of such pavement.

When the street or roadway has been thus prepared for the reception of my pavement, I then cover the surface of the roadway or bed with tarred paper, or with lime mortar, or hydraulic cement, laid over it about two inches in thickness, or with a cheap flooring, which may be also covered with tar, or any other preventive to moisture can be used for said foundation or support, the object and effect of such support or foundation being to prevent moisture from being absorbed from the ground by the wooden blocks. Said foundation or support is designated in said drawing by the letters *d d*.

In further carrying out my invention, I make use of two sets or series (a a a, b b b) of wooden blocks. They are cut with parallel sides, lines, or surfaces, from joists or timber about four inches square, or of other suitable shapes and dimensions, in cross-sections; longer blocks *a a a* being made about eight inches in length, while the shorter blocks, or those represented at *b b b*, are formed about half the length of the others. These blocks are placed end upwards upon said foundation or support, and are arranged both transversely
737 and longitudinally, so that the long and the short blocks shall be arranged alternately in such direction, or run as seen in the drawings. Such an arrangement of them leaves cavities *c c c* between the said blocks, each of the said cells being bounded by four of the larger blocks, and having its bottom formed by one of the shorter blocks. The upper ends of the long blocks, when thus placed together, present a checkered or tesselated appearance, and

they will exhibit the open spaces arranged together in a similar manner. Into each of these cells a small quantity or layer of coarse salt may be put. These cells are filled up with small broken stone or coarse clean gravel, the whole being firmly rammed, so that the upper surface of the mass in each cell shall be firm and level. Next, mineral or vegetable tar or pitch is to be poured over the whole surface of the pavement and into the cells or cavities containing the broken stone or gravel, so as to penetrate entirely between the pieces of stone or gravel and cement them together. The tar, permeating into the squares containing the broken stone or gravel, will cause the masses of the sand to adhere firmly to the surrounding blocks, and will admit of expansion of the mass by the weight of the wheels of carriages in passing over them, such expansion serving to fill up the space which might otherwise be made by shrinkage of the wooden blocks. In order to prevent the blocks from being
738 forced below one another, in some of my modes of constructing the pavement, they may be pinned together with wooden pins extending from block to block. Instead of the broken stone and tar, any other suitable cementing material or cement may be employed in the cells. I prefer, however, common tar or pitch and gravel or broken stone, as such in practice has been found to operate to great advantage, and to be very durable in use, and to prevent a surface over which it is very difficult for a horse's foot to slip or slide, as it will on ordinary wooden pavement when its surface is wet or covered with mud. The shorter blocks b b b serve to uphold the masses of cement and stone in the cells or cavities, so as to prevent particles of the broken stone or gravel from working under the longer blocks, and thus upheaving them and causing inequalities in the pavement; and when such masses are compacted by any blow upon them or the rolling of wheels over them, instead of being pressed down so as to slide down between the blocks, they are made to spread latterly, and thereby completely close up the joints between the blocks and themselves, so as to prevent water from passing down into the joints between the blocks. As the salt will slowly melt, it will penetrate into the wood and aid in preserving it from decay.

My invention may be carried out in another form, that is to
739 say, as seen in figure 1 and figure 3, drawing No. II. The long blocks may be arranged side by side, and in rows transversely of the roadway, and with spaces about one inch in thickness between each two rows of them, in each of which spaces a strip of board may be introduced edgwise or vertical, the width of the board being equal to about half the length of the block. These boards being made to rest on the foundation or support, resting on the surgace of the ground, create with the rows of the blocks long cells or grooves extending transversely across the roadway, such cells or grooves being subsequently filled with broken stone or gravel and tar or cement. I would remark, as to the great durability of my pavement, that for the purpose of experiment I have had some of it in use for six years before the month of March, eighteen hundred and fifty-four, on a road over which the travel has been very great.

Some of the advantages of my improved pavement are to be found in the hold that it affords to the feet of horses, in the little noise that is produced by carriages in passing over it, the absence of noise resulting from the peculiar character of the materials of which the pavement is composed. The pavement is also very durable,
740 its durability being occasioned by reason of the friction of the travel over it being produced upon the slightly elastic extremities of the fibres of the wooden blocks. Moisture is excluded from the wood by the materials employed for the support of the blocks, also by the preventives, also by the tarry covering, which is placed over the top surface as hereinbefore described. My pavement has the advantage of great cleanliness in comparison with most other pavements, because in the first place, as there is very little wear of its upper surface, very little dust is likely to form upon it, and such as does form is quickly removed therefrom by rains and winds.

Having thus fully described the parts and combination of the parts, the operation of my improved wooden pavement, and shown various modes in which the same may be constructed and made to operate, without changing the principal of its construction and operation, what I claim therein as my invention and desire to secure by letters patent is: The so combining and arranging the foundation or support (or its equivalent) of said wooden pavement resting on the
741 roadway surface or bed, substantially as herein described, with said long and short blocks above described, (or their equivalents,) which said blocks are combined in such a manner as that partitions shall be made, leaving cells or channels between them, with a wooden bottom formed by the shorter blocks some distance above the lower ends of the longer blocks for the reception of the broken stone or gravel and tar and other like materials; and also combined with such cells or channels filled with broken stone, gravel, and tar, or other like material, substantially as herein described, having such wooden bottom to rest upon substantially as herein described, whereby the particles of pounded stone or gravel are prevented from working under the lower ends of the longer blocks, and whereby water is prevented from passing from the surface of the pavement downwards through the joints of said wooden blocks, and also moisture is prevented from being absorbed upwards from the ground by said wooden blocks, substantially as herein described.

SAMUEL NICOLSON.

Witnesses:
STEPHEN A. GOODWIN.
DANIEL GOODWIN, Jr.

742 STATE OF ILLINOIS, *Cook county, City of Chicago, ss*:

On this fifth day of November, A. D. 1863, personally appeared before me, Daniel Goodwin, jr., a notary public, in and for the city of Chicago, in the county and State aforesaid, the above-named Samuel Nicolson, and made solemn oath that he verily believes him-

self to be the original and first inventor of the improved wooden pavement described in the specification annexed to the patent granted to him, August 8, 1854, and herein described; and that he does not know or believe that the same was ever before known or used prior to its invention by him; and that he is a citizen of the United States.

DANIEL GOODWIN, JR.,
Notary Public.

Endorsed: Samuel Nicolson. Spec'n. Rec'd and filed Nov. 18, '63. E. E.

[5-ct. stamp.]

743 No. 1,583.—Samuel Nicolson of Boston, county of Suffolk, State of Massachusetts.—Wooden pavements.

Rec'd November 18, 1863.
Petition, November 18, 1863.
Affidavit, November 18, 1863.
Specification, November 18, 1863.
2 drawings, November 18, 1863.
Old patent, November 18, 1863.
Cert. dep.
1. Cash, $30, Nov. 18, 1863.
Add'l fee cert.
Add'l fee cert., cash.
Examined, James, Nov. 18, 1863.
2. Issue, Hayes, Nov. 19, 1863.
4. Patented Aug. 8, 1864.
Reissued Dec. 1. 1863.
Recorded vol. 12, page 273.
Circular.

Endorsed: Improvement in wooden pavement.

744 The U. States Patent Office to all persons to whom these presents shall come, greeting :

This is to certify that the annexed is a true copy from the files of this office of the file wrapper and contents and drawing in the matter of the letters patent granted Samuel Nicolson, August 8th, 1854, No. 11,491.

In testimony whereof, I, Thos. C. Theaker, Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed, this twenty-third day of October, in the year of our Lord one thousand eight hundred and sixty-five, and of the independence of the United States the ninetieth.

[SEAL.] T. C. THEAKER.

745 *Imp'd wooden pavements.*

No. 11,491.—Samuel Nicolson of Boston, county of Suffolk, State of Massachusetts.—Wooden pavements.

Rec'd April 10, 1854.
Petition, April 10, 1854.
Affidavit, April 10, 1854.
Specification, April 10, 1854.
2. Drawings, April 10, 1854.
3. Model, April 12, 1854.
Cert. dep. $10, April 10, 1854.
Caveat, Aug. 4, 1847.
2. Examined July 27th, A. Herbert.
Issue, Shugert.
3. Patented Aug. 8, 1854.
Recorded vol. 58, page 184.

R. H. EDDY, *Boston.*

Rejected June 25th, '54.
Spec'n and 1 Dr. ret'd by request, June 26th, '54.
Letter, July 20th, 1854.

746 *Letter from R. H. Eddy, att'y.—Rec'd and filed April 10, 1854.—S. T. S.*

BOSTON, *April 7th*, 1854.

SIR: I herewith send you the petition, specification, drawings, and treas. cert. for $10, for the application of Sam'l Nicolson. A caveat has been filed, and the model an inst. in paving will be sent by express this day.

Yours, respectfully,

FRANCIS GOULD.
For R. H. EDDY.

747 To the Commissioner of Patents of the United States of America:

The petition of Samuel Nicolson, of Boston, in the county of Suffolk and State of Massachusetts, respectfully represents, that your petitioner has invented a new and useful improvement in wooden pavements, which he verily believes has not been known or discovered by any other person or persons prior to his invention thereof.

Your petitioner therefore desires that letters patent may be granted to him, securing to him and his legal representatives, for the term of fourteen years, an exclusive property in the above-mentioned invention, or right to make and use it, and to vend it to others, by them to be made, used, or sold, as it is described in the accompanying and written specification; your petitioner being a citizen of the United States of America, and having paid thirty dollars into the treasury of

the United States, and complied with all the other conditions expressed in the acts of Congress, for such cases made and provided.

Signed at Boston, in the State of Massachusetts, the twenty-
748 ninth day of March, in the year of our Lord eighteen hundred and fifty-four.

SAMUEL NICOLSON.

Hon. CHAS. MASON, *Comm'r of Patents, Washington, D. C.*

To the Commissioner of Patents of the United States of America:

Having invented a new and useful improvement in wooden pavements, and made application for letters patent of the United States of America therefor, I do hereby appoint, and request you will recognize, R. H. Eddy, civil engineer, of Boston, in the State of Massachusetts, to be my true, sufficient, and lawful attorney and agent for me, and in my name to attend to procuring and receiving the said letters patent, and to alter and amend my specifications, drawings, and claims, previous to the said letters patent being granted, in whatever way, manner, and extent he, the said Eddy, may consider most desirable for my interest, and to execute and deliver any papers, and generally to do and perform all such acts, matters, and things as may be necessary for the complete and effectual obtaining of the said letters patent, or for the withdrawal of the application for the same, or any papers, drawings, or models connected therewith, should he at any time deem such withdrawal of the said application ad-
749 visable. In case of such withdrawal, the Commissioner of Patents, or the Treasurer of the United States, is hereby authorized to pay to the said Eddy, for me, and the said Eddy is empowered to receive for me such sum of money as the law provides shall be returnable, under such circumstances, to any applicant for a patent.

Signed at Boston, in the State of Massachusetts, the twenty-ninth day of March, A. D. 1854.

SAMUEL NICOLSON. [SEAL.]

Witness: F. P. HALE.

Petition and power of att'y to R. H. Eddy.—Rec'd and filed April 10, 1854.—*S. T. Shugert.*

STATE OF MASSACHUSETTS, *County of Suffolk, ss:*

On this twenty-ninth day of March, A. D. 1854, personally appeared before me the above-named Samuel Nicolson, and acknowledged the above instrument to be his free act and deed.

R. H. EDDY,
Justice of the Peace.

750 To all to whom these presents shall come:

Be it known, that I, Samuel Nicolson, of Boston, in the county of Suffolk, and State of Massachusetts, have invented a new and useful improvement in wooden pavements, and I do hereby declare that

the same is fully described and represented in the following specification, and the accompanying drawings, letters, figures, and reference thereof.

[Here follows drawing, marked page 750.]

Of the said drawings, figure 1 represents a top view of my improved pavement. Figure 2 is a transverse and vertical section of it. In carrying out my invention, I make use of two setts or series, a a a, b b b, of wooden blocks. They are cut from joist or timber four inches square, or of other suitable dimensions, in cross section; the longer blocks, a a a, being made about eight inches in length, while the shorter blocks, or those represented as b b b, are formed about half the length of the others.

These blocks are placed end upwards, and are arranged both transversely and longitudinally, so that the long and short blocks shall be arranged alternately in each direction, or run as seen in the drawings.

751 Such an arrangement of them leaves cells or cavities c c c, between the said blocks, each of the said cells being bounded by four of the larger blocks, and having its bottom formed by one of the shorter blocks. The upper surfaces of the long blocks, when thus placed together, present a checkered or tessellated appearance, and they will exhibit the open space or cells arranged together in a similar manner.

Into each of these cells a small quantity or layer of coarse salt may be put, and the cells filled up with small broken stone or coarse gravel, the whole being firmly rammed, so that the upper surface of the mass in each cell shall be firm and level. Next, mineral or vegetable tar or pitch is to be poured over the whole surface of the pavement and into the cells or cavities containing the broken stone or gravel, so as (R. H. Eddy, justice of the peace,) to penetrate entirely between the pieces of stone or gravel, and cement them together. The tar permeating into the squares containing the broken stone, will cause the masses of the same to adhere firmly to the surrounding blocks, and will admit of expansion of the mass, by the weight of the wheels of carriages in passing over them, such expansion serving to fill up such space as might otherwise be made by shrinkage of the wooden blocks. In order to prevent the blocks

752 from being forced below one another, they may be pinned together with wooden pins, extending from block to block.

Instead of the broken stone and tar, any other suitable cementing materials or cement may be employed in the cells. I prefer, however, common tar or pitch and gravel or broken stones, as such in practice has been found to operate to great advantage and to be very durable in use, and to present a surface over which it it is very difficult for a horse's foot to slip or slide, as it will on the ordinary wooden pavement when its surface is wet or covered with mud. The smaller blocks b b serve to uphold the masses of cement and stone in the cells; and when such masses are compacted by any blows upon them or the rolling of wheels over them, instead of being pressed

.own, so as to slide between the blocks, they are made to spread lat-
:rally, and thereby completely close up the joists between the blocks and themselves, and so as to prevent water from passing down into the joists between the blocks. As the salt will slowly melt, it will penetrate into the wood and aid in preserving it from decay. The earth upon which the pavement is to rest may be prepared to receive the pavement, by covering its surface with tarred paper or other preventative to moisture being absorbed from the ground by the wooden blocks. My invention may be carried out in another
753 form; that is to say, the long blocks may be arranged side by side and in rows transversely of the roadway, and with spaces of about one inch in thickness between each two rows of them, in each of which spaces a strip of board may be introduced, the width of the board being about equal to about half the length of the block.

These boards, being made to rest on the surface of the ground, create, with the rows of the blocks, long cells or grooves, extending transversely across the roadway, such cells or ground being subsequently filled with broken stones or gravel and tar or cement.

I do not, however, consider this method of carrying out my invention of so much value as the first, on account of the broken stone and tar cement not being arranged between the blocks in longitudinal as vell as transverse directions.

In order to prepare the earth of a roadway for the reception of my improved pavement, instead of employing tarred paper as above described, the upper surface of the roadway, after being suitably graded, may be covered with lime mortar or hydraulic cement, which may be laid over it about two inches in thickness; or it may have a superstructure of flooring of cheap boards laid over it, the pavement being afterwards laid upon such boards.

754 I would remark, however, that in view of the great durability of this pavement, for the purpose of experiment I have had some of it in use for six years on a road over which the travel has been very great, such flooring would seem to be unnecessary. (Insert here the additions in amended claim, filed April 10, '54.)

What I claim in my invention is, to so combine or arrange the blocks or wooden portion of the pavement that there may be cells or channels formed by such arrangement between them as described, and for the reception of tar and gravel, or materials of like character; and that each cell or channel shall have a wooden bottom for the tar and gravel cement to rest on, whereby, when the mass of tar and stone in each cell is pressed down by the wheels of carriages, it shall be prevented from being forced through the cavity and be caused to spread in lateral directions, so as to maintain a firm and close joint between the adjacent blocks, such as will operate to prevent water from passing down between their joints.

In testimony whereof, I have hereunto set my signature this twenty-ninth day of March, A. D. 1854.

SAMUEL NICOLSON.

Witness—
R. H. EDDY, F. P. HALE.

755 STATE OF MASSACHUSETTS, *County of Suffolk, ss:*

On this twenty-ninth day of March, A. D. 1854, personally appeared before me the above-named Samuel Nicolson, and made oath that he does verily believe himself to be the original and first inventor of the invention for which he solicits a patent, which invention is referred to and described in the above or within specification; that he does not know or believe the same to have ever before been known or used; and that he is a citizen of the United States of America.

R. H. EDDY,
Justice of the Peace.

Specification and oath rec'd and filed April 10, 1854.

S. G. SHUGERT.

756 *Amended claim.—Filed April* 10, 1854.

I, Samuel Nicolson, hereby amend my specification by inserting after the word, "unnecessary," of line 29 and 30, of page 3, the following, viz:

Some of the advantages of my improved pavement are to be found in the hold that it offers to the feet of horses; in the little noise that is produced by carriages in passing over it; the absence of noise resulting from the peculiar character of the materials of which the pavement is composed.

This pavement is also very durable, its durability being occasioned by reason of the friction of the travel over it, being produced upon the slightly elastic extremeties of the fibres of the wooden blocks.

Moisture is excluded from the wood by the materials employed for the support of the blocks; also by the preventatives; also by the tarry covering which is placed over the top surface, as hereinbefore described.

My pavement has the advantage of great cleanliness in comparison with most other pavements, because in the first place, as there is very little wear of its upper surface, very little dust is likely to form upon, and such as does form upon it is quickly removed by
757 rains and winds.

Mar. 29th, 1854.

SAMUEL NICOLSON.
By his attorney, R. H. EDDY.

Amend't to specification, rec'd and filed April 10, '54.

S. T. SHUGERT.

Office letter to Sam'l Nicolson, June 21*st*, 1854.—*Rejected.—A. Herbert.*

U. S. PATENT OFFICE,
Washington, June 21*st*, '55.

SIR: Your claims to letters patent for imp't in wooden pavements have been examined, and rejected for want of novelty in the device.

For a substantial equivalent, see Barlow's London Patent Journal, vol. 11, and page 122, Wood's patent.

Respectfully, your ob't serv't,

SAM'L NICOLSON, care of R. H. EDDY, Boston, Mass.

758 BOSTON, *June* 24, 1854.

SIR: I have to request the favor of you to return to me the specification and drawings of the application of Samuel Nicolson, rejected on the 21st inst.

Yours respectfully, R. H. EDDY.

Hon. CHAS. MASON, *Com'r of Patents, Washington, D. C.*

Endorsed: Sam'l Nicholson. June 24th, 1854. Filed June 26th, 1854. A. Herbert.

759 U. S. PATENT OFFICE,
Washington, June 26th, '54.

SIR: Your specification and one drawing are herewith returned to you, in complianee with request of the 24th inst.

Respectfully, y'r ob't serv't,

SAM'L NICOLSON, care of R. H. Eddy, Boston, Mass.

Endorsed: Office letter to Sam'l Nicolson. June 26th, 1854. Spec. and one dr. ret'd. A. H.

760 BOSTON, 18*th July,* '54.

SIR: In your letter of rejection of the application of Sam'l Nicolson, esq., you refer us to an invention of Francis Frederic Woods, which appears from the description to have been patented in England, on November 30th, 1850.

If you will examine the files of the Patent Office you will find that Mr. Nicolson, about August, 1847, filed a caveat on the invention which forms the subject of this application.

On the 19th day of July, 1848, Mr. Nicolson had about four thousand square feet of his pavement laid down upon the Western avenue, leading out of Boston. It was placed there for the purpose of experiment, and to discover what would be the effects of time and travel upon it. This same pavement is still in use. Should the caveat not be sufficient to satisfy you of the propriety of ordering a patent to be issued, or, in other words, that Mr. Nicolson's invention was made prior to that to which you have referred him, he stands ready to furnish you with such further proof as may be necessary.

Yours respectfully,

R. H. EDDY.

761 Hon. CHAS. MASON,
Com'r of Patents, Washington, D. C.

Endorsed: Sam'l Nicolson. July 18th, 1854. Filed July 20, '54. A. Herbert.

BOSTON, 19*th July*, 1854.

SIR: Herewith I return you the specification of Mr. Samuel Nicolson, which I should have sent you yesterday with the letter I wrote you in regard to his case.

Yours, respectfully,

R. H. EDDY.

Hon. CHAS. MASON,
Com'r Patents, Washington, D. C.

762 *Office letter to Sam'l Nicholson, July 20th, 1855.—A. H.*

U. S. PATENT OFFICE,
Washington, July 20th, 1854.

SIR: Your letter of the 18th is received, and in reply I have to say that the caveat referred to, as filed in 1847, (which had escaped the notice of the office,) is deemed sufficient evidence of your invention being older than the reference given.

The office will, therefore, reconsider the case upon its being returned, and if no older reference can be found, a patent will be granted.

Respectfully, your ob't serv't,

SAM'L NICOLSON,
Care of R. H. EDDY, *Boston, Mass.*

763 On this day, to wit, the sixteenth day of January, A. D. 1867, came the solicitors for the defendant, and filed herein its appeal bond, in the words and figures following, to wit:

Circuit Court of the United States for the northern district of Illinois.

THE CITY OF CHICAGO, appellant,
vs.
SAMUEL NICOLSON, appellee.

Know all men by the presents, that the City of Chicago, Charles C. P. Holden, and Charles G. Wicker, are held and firmly bound unto the above-named Samuel Nicolson in the sum of forty thousand dollars, to be paid to the said appellee, for the payment of which, well and truly to be made, the said City of Chicago binds itself, and its successors, and the said Holden, and the said Wicker, bind themselves, their heirs, executors, and administrators, jointly and severally, firmly by these presents.

In witness whereof, the City of Chicago hath caused its corporate seal to be hereunto affixed, and these presents to be signed by the mayor and comptroller and countersigned by the city clerk;
764 and the said Holden and the said Wicker have also signed these present and affixed their seals thereto, this fifteenth day of January, A. D. 1867.

Whereas the above-named Samuel Nicolson did, on the seventh

day of January, A. D. 1867, recover a decree in said Circuit Court of the United States for the northern district of Illinois, against said City of Chicago for the sum of twenty-nine thousand seven hundred and thirty dollars and thirty cents, and costs of suit, amounting to the sum of dollars and cents; and whereas the said City of Chicago has prosecuted an appeal from said decree to the Supreme Court of the United States, at the city of Washington, in the District of Columbia, to reverse said decree rendered as aforesaid:

Now, therefore, the condition of this obligation is such, that if the above-named appellant shall prosecute its appeal to effect, or on its failure so to do, shall pay, or cause to be paid, the amount of said decree, together with all damages and costs, then this obligation shall be void; otherwise the same shall be and remain in full force and virtue.

J. B. RICE, *Mayor.*

765 [SEAL.] WALTER KIMBALL,
City Comptroller.

[SEAL.] CHARLES C. P. HOLDEN.

[SEAL.] CHARLES G. WICKER.

Attest: A. H. BODMAN, *City Clerk.*

We are satisfied with this bond and sureties.

GOODWIN & LARNED,
Sol'r for Comp't.

Approved.

THOMAS DRUMMOND.

Filed Jan'y 16th, 1867.

WM. H. BRADLEY, *Cl'k.*

766 And on this day came said parties, by their solicitors, and filed their stipulation in said cause, in words and figures following, to wit:

In the Circuit Court of the United States, northern district of Illinois, of the term, A. D. 1867.

SAMUEL NICOLSON
vs.
THE CITY OF CHICAGO. } In chancery.

Whereas certain documents, pamphlets, specifications, and exhibits, hereinafter described, and which were used and read in evidence on the hearing of the above-entitled cause in the said Circuit Court of the United States, contain divers diagrams, &c., which it would be exceedingly difficult, if not impracticable, to copy into and make part of the record, it is therefore hereby stipulated and agreed that said documents, pamphlets, specifications, and exhibits may be taken from the files of said Circuit Court by the defendant, and kept for the use of both parties, and produced in the Supreme Court of the

767 United States, and may be there used and read in evidence in the same manner and to the same extent and subject to the

same exceptions as though they had been incorporated into the record in this cause.

The following is a general description of the documents, pamphlets, specifications, and exhibits:

No. 11,466. Specification of Richard Love, junior.
No. 8,473. Specification of William Grimman.
No. 8,041. Specification of David Stead.
No. 8,657. Specification of Thomas Wood, the younger.
No. 9,163. Specification of Richard Gurnee.
No. 9,410. Specification of John Perring.
No. 9,640. Specification of Joseph Crannis and Robert Kemp.
No. 9,737. Specification of Henry Austin.

Together with the certificate of the authenticity of the said documents, and the stipulation of the solicitors of the respective parties that all of the same might be used and read in evidence in the said Circuit Court.

Also the "Mechanic's Magazine," 1843, vol. 38, marked "B," on the title page; and the London Journal for Nov., 1839, and published in London, marked "A."

768 Also the certificate or affidavit of R. A. Brooman, of the publication of said documents, and his possession of the same, dated March 31, 1863, together with the certificates of the notary public and consul of the United States [attached] thereto attached.

Also a stipulation of the solicitors of the respective parties, that the same might be used in evidence on the hearing of said cause.

Also two printed documents, respectively entitled Nicolson Pavement, invented by Samuel Nicolson "of Boston, Mass.," the one of date 1859, and the other of date 1864, being complainant's Exhibit E, and defendants Exhibit A, dated Nov. 8, 1867.

GOODWIN & LARNED,
Sol'rs for Compl.
F. A. IRVIN,
Sol. and Couns. for Def't.

Filed Nov. 9, 1867.

WM. H. BRADLEY, *C'lk.*

769 NORTHERN DISTRICT OF ILLINOIS, *ss*:

I, William H. Bradley, clerk of the Circuit Court of the United States for said northern district, do hereby certify the foregoing transcript, from pages one to seven hundred and sixty-eight inclusive, to be a true and correct copy from the record of all the proceedings had in said court, in said entitled cause of Samuel Nicolson, complainant, against The City of Chicago, as the original of the same now remain in my custody.

In testimony whereof I have hereunto set my hand and affixed the seal of said court, at my office in Chicago, in said northern district, this 29th day of November, A. D. 1867.

[SEAL.] WM. H. BRADLEY, *Clerk.*

[5-ct. revenue stamp.]

SUPREME COURT OF THE UNITED STATES.

No. 183.

DECEMBER TERM, 1868.

THE CITY OF CHICAGO, APPELLANT,

vs.

GEORGE T. BIGELOW, ADMINISTRATOR OF SAMUEL NICHOLSON, DECEASED.

AMENDMENT TO RECORD.—PRAYER FOR APPEAL.—FILED OCTOBER 2, 1869.

Circuit court of the United States, northern district of Illinois.—In chancery.

TUESDAY, *June* 29, 1869.

Present, the Hon. David Davis, circuit judge; Hon. Thomas Drummond, district judge.

SAMUEL NICHOLSON *vs.* THE CITY OF CHICAGO. } Chancery.

And now at this day come the said city of Chicago, by C. Beckwith, of counsel, and Goodwin & Larned, who were solicitors of complainant, and who are solicitors of his administrator in the Supreme Court of the United States; and the said counsel of the said city, on affidavit and motion heretofore filed in the said suit in the said court, moves the court for the entry of an order nunc pro tunc showing the prayer for the allowance of an appeal by said city to the said Supreme Court as of the seventh day of January, A. D. eighteen hundred and sixty-seven; and it appearing to the court that the solicitor of said city did in fact at the time aforesaid give the court to understand that the said city intended to prosecute an appeal of said suit to said Supreme Court; and the counsel for both parties as well as the court being fully apprized in open court of that fact, and the solicitor of said city acting upon the understanding that such appeal had been formally prayed, did, at the December term, eighteen hundred and sixty-six, of said court, being the term when the final decree was entered in said cause, and within ten days after the entry of such decree at said term, viz., on the sixteenth day of January, A. D. eighteen hundred and sixty-seven, to produce to the court the bond of said city, properly executed by it, as well as good sureties, and with the approval thereof endorsed thereon by said Good-

win & Larned, and which bond was then and there approved by the then presiding judge of said court; and it also appearing to the court that the counsel of both parties as well as the court then understood an appeal had been in fact prayed by said city and allowed, and the counsel for both parties having been heard in the premises, and the court having considered thereof—it is therefore ordered that the record of the said cause in the said court be so amended as to show the prayer for an appeal by the said city of Chicago on the seventh day of January, eighteen hundred and sixty-seven, to a term of the Supreme Court of the United States to be held at the city of Washington on the first Monday of December, A. D. eighteen hundred and sixty-seven, and the allowance thereof by the court on the said seventh day of January.

NORTHERN DISTRICT OF ILLINOIS, *ss:*

I, William H. Bradley, clerk of the circuit court of the United States for said northern district of Illinois, do hereby certify the above and foregoing to be a true and correct copy of the order entered of record in said court on the twenty-ninth day of June, A. D. 1869, in the cause wherein Samuel Nicholson is complainant and the city of Chicago is defendant, as appear from the records of said court, now remaining in my custody and control.

In testimony whereof, I have hereunto set my hand and affixed the seal of said court, at my office, in Chicago, in said district, this twenty-ninth day of September, A. D. 1869.

[SEAL.] WM. H. BRADLEY, *Clerk.*